Metal Finishing

POLISHING AND BUFFING · BARREL FINISHING · CLEANING
PLATING · ANODIZING · RUST PROOFING · LACQUERING & ENAMELING

NOVEMBER, 1958

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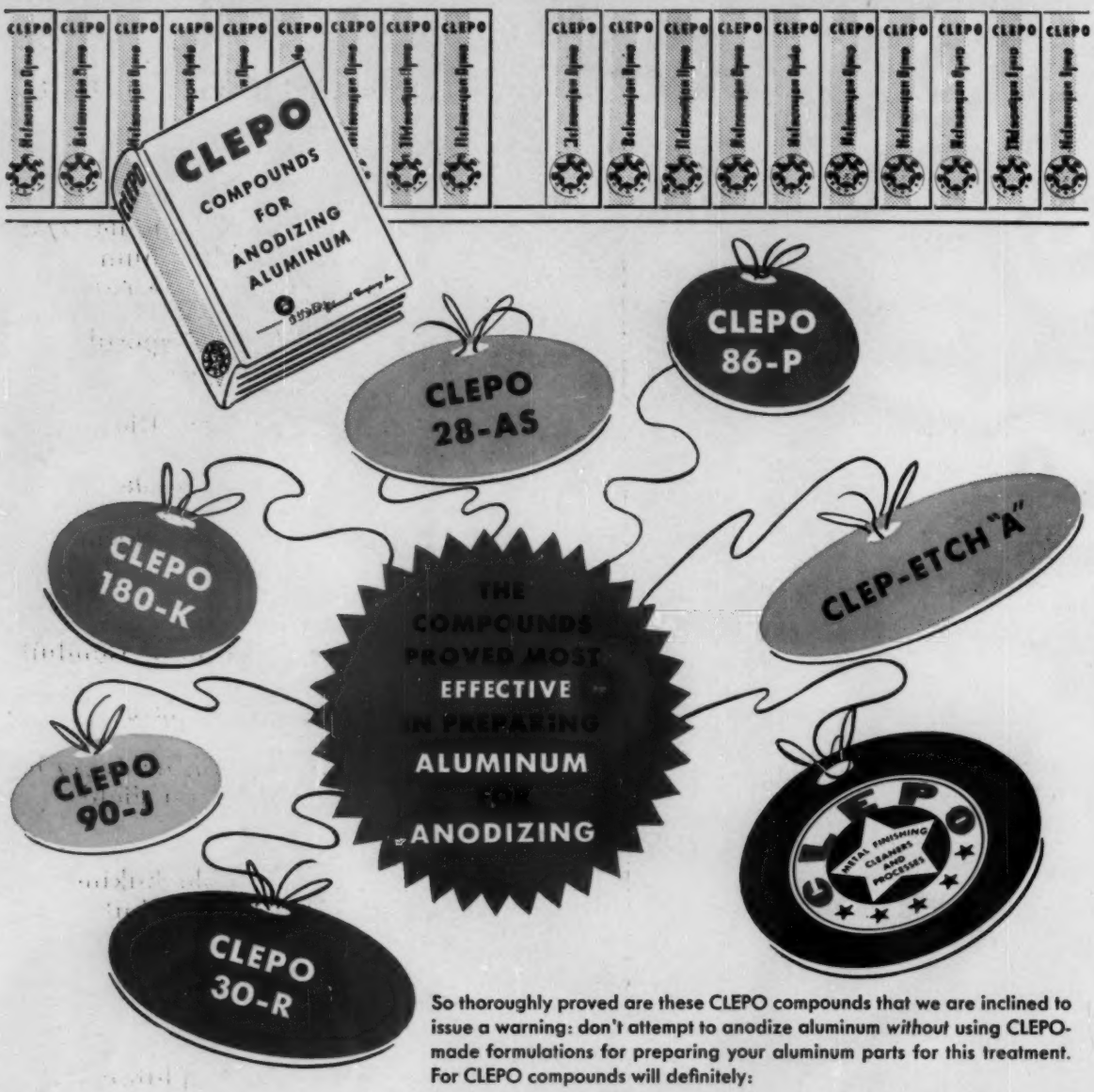
Read and pass on—

LIBRARY OF CLEPO SERVICE



So thoroughly proved are these CLEPO compounds that we are inclined to issue a warning: don't attempt to anodize aluminum *without* using CLEPO-made formulations for preparing your aluminum parts for this treatment. For CLEPO compounds will definitely:

- * remove oil and dirt without attacking the base metal
- * remove buffing compounds without tarnishing the highest polish on the aluminum
- * remove oxide and scale without dangerous acid
- * remove smut after etching without fuming or hot acid
- * remove smut from silicon-base alloys without hydrofluoric acid
- * remove anodize coatings from rejects or racks without hot solutions

These are six outstanding CLEPO compounds useful in the field of anodizing, each formulated to do certain jobs best.

If your production involves anodizing, phone or write to have a CLEPO Field Service man call to demonstrate the benefits CLEPO compounds can bring you. Or if you have some particular steps that are bothering you and want a quick answer, send us the details. We'll be glad to make recommendations and send you a trial sample.

FREDERICK GUMM *Chemical Company Inc.*

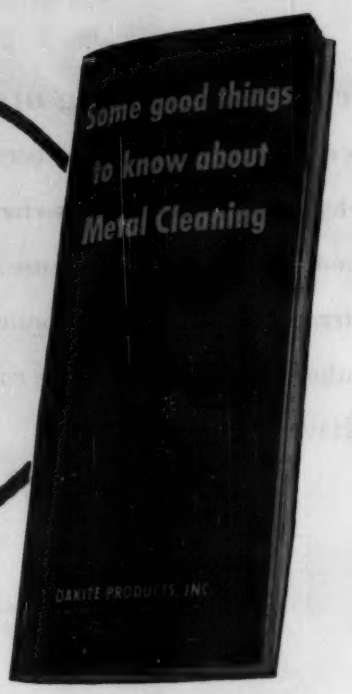
538 FOREST STREET, KEARNY, N. J.

How to make plating upon aluminum an exact science: **For many years, hundreds of manufacturers have been using Alumon,® an Enthone process, to prepare aluminum alloys for electroplating. Enthone chemists work out the plating cycles, give in-the-plant assistance. Alumon is an easy process to use and it costs less than ½¢ per square foot of surface plated! Write for literature about this economical and efficient process. Also find out about Etchalume,® Weldal,® and other specialized Enthone compounds for finishing aluminum. Enthone, Inc., 442 Elm Street, New Haven 11, Connecticut.**

ENTHONE

ENTHONE, INC. IS A SUBSIDIARY OF AMERICAN SMELTING AND REFINING COMPANY

WHICH METAL-CLEANING JOBS WOULD YOU LIKE TO IMPROVE?



¶ Are you cleaning metal in the most economical way? *See page 9 of Oakite's FREE booklet on Metal Cleaning.*

¶ Are you cleaning metal the fastest way? *See page 12.*

¶ Do you need room-temperature cleaning combined in one operation with temporary rustproofing? *See pages 12 and 14.*

¶ Do you know the advantages of *alkaline* pickling? *See page 21.*

¶ Have you compared the values of iron phosphate coating and zinc phosphate coating in preparation for painting? *See pages 22 and 25.*

¶ Can you use a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? *See page 30.*

¶ Do you have trouble stripping epoxy resins, pigment residues, phosphate coatings and under-paint rust? *See page 31.*

¶ How do you clean parts that are too large to be soaked in tanks or sprayed in machines? *See page 31.*

¶ Are you getting full profit out of your finishing barrels? *See page 32.*

¶ What do you do when oversprayed paint neither floats nor sinks in your paint spray booth wash water? *See page 35.*

¶ Do you need better protection against rusting in process or in storage? *See page 37.*

Here is the full table of contents of Oakite's 44-page illustrated booklet called "*Some good things to know about Metal Cleaning*".

Tank cleaning methods
Machine cleaning methods
Ultrasonic cleaning
Electrocleaning steel
Electrocleaning nonferrous metals
Pickling, deoxidizing, bright dipping
Applying iron phosphate coatings in preparation for painting
Applying zinc phosphate coatings
Conversion coatings for aluminum and zinc
Cleaning, removing rust and conditioning for painting in one operation
Paint stripping
Steam-detergent cleaning
Barrel finishing
Better cleaning in hard-water areas
Treating water in paint spray booths
Rust prevention
Machining and grinding

OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

Technical Service Representatives in Principal Cities of U.S. and Canada
Export Division Cable Address: Oakite

FREE For your copy of "*Some good things to know about Metal Cleaning*" write to Oakite Products, Inc., 26 Rector St., New York 6, N. Y.

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For 59 Years ...L'HOMMEDIEU...

year after year has manufactured Reliance Plating, Polishing Equipment, Supplies for Better and More Profitable Metal Finishing

RELIANCE PLATING BARRELS

Easy to Handle . . . Save Time and Money
Uniform Current Distribution
Plating Begins at Once

* * *

Lucite — Hard Rubber or Bakelite Cylinders
Motor — Geared in Head
Minimum Maintenance

* * *

Write for Reliance Plating Barrel Specifications

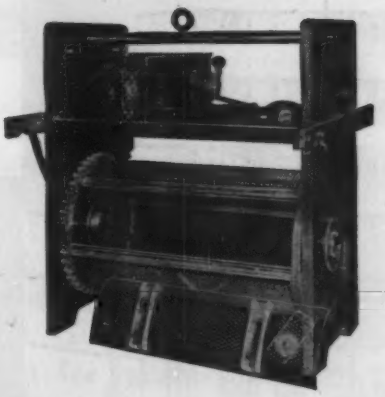
RELIANCE SELENIUM RECTIFIERS

Designed for all metal finishing operations.

High power factor and low ripple.

6 to 48 volts D.C.

Basic-self-contained or with Remote Control.



RELIANCE LUCITE

Portable Plating Barrel

Built of extra heavy High Temperature Lucite for volume production and stability.

Cylinder: 10"x18" inside. Equipped with Reversing Switch to permit stopping and securing barrel for loading and/or unloading.

Chas. F. L'Hommedieu & Sons Co.

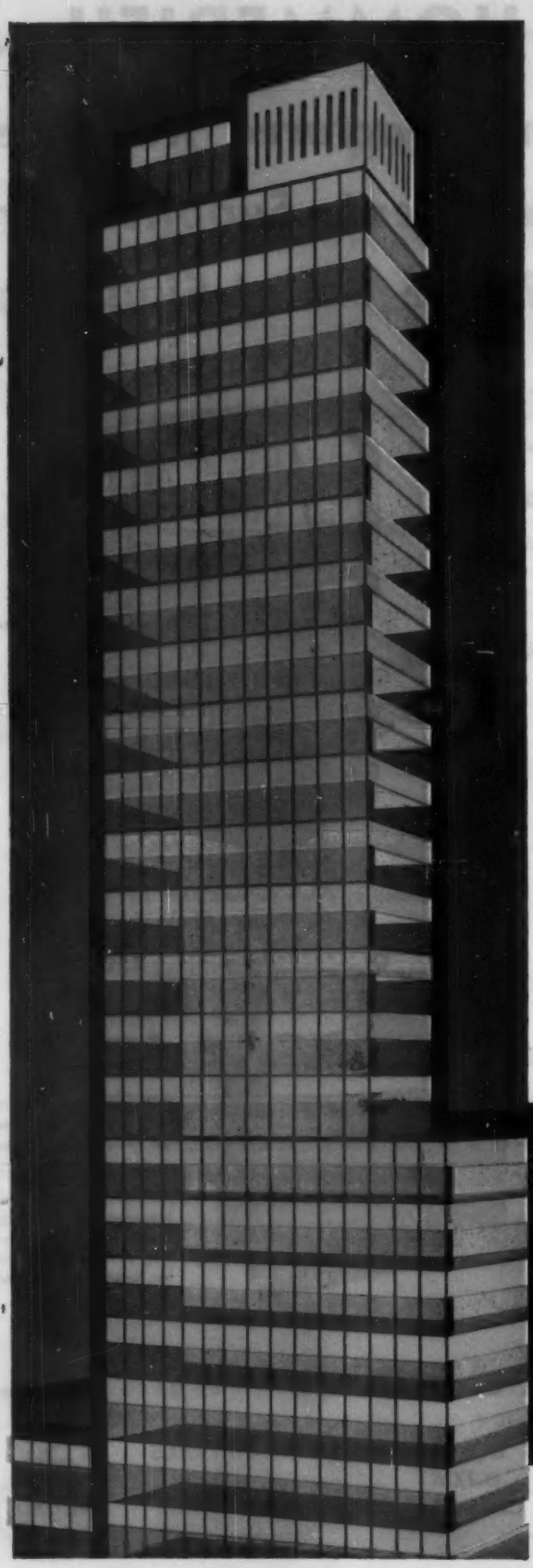
MANUFACTURERS OF METAL FINISHING EQUIPMENT AND SUPPLIES
GENERAL OFFICE AND FACTORY
4521 OGDEN AVE. CHICAGO 23, ILL.

Chas. B. Little Co.
Newark, N. J.

W. R. Shields Co.
Detroit, Mich.

Branches:
Cleveland & Los Angeles

RELIANCE



GOLDEN AGE

FOR ALUMINUM!

PFIZER OXALATES CAN HELP YOU ACHIEVE BETTER LIGHT-FASTNESS, MORE UNIFORM COLORING

● In the fast-growing field of colored aluminum, you can develop important sales advantages with PFIZER OXALATES.

In making gold colored aluminum, particularly, oxalates will give you improved light-fastness and uniformity. Coloring is accomplished by precipitating iron oxide in the aluminum oxide coating from solutions containing ferric oxalate or ferric ammonium oxalate. Shades, from yellow to brown, can be obtained readily by varying the processing technique.

Why not investigate the big profit potential in producing better colored aluminum through the use of PFIZER OXALATES? Write for further technical information on PFIZER OXALATES.

Manufacturing Chemists for over 100 Years

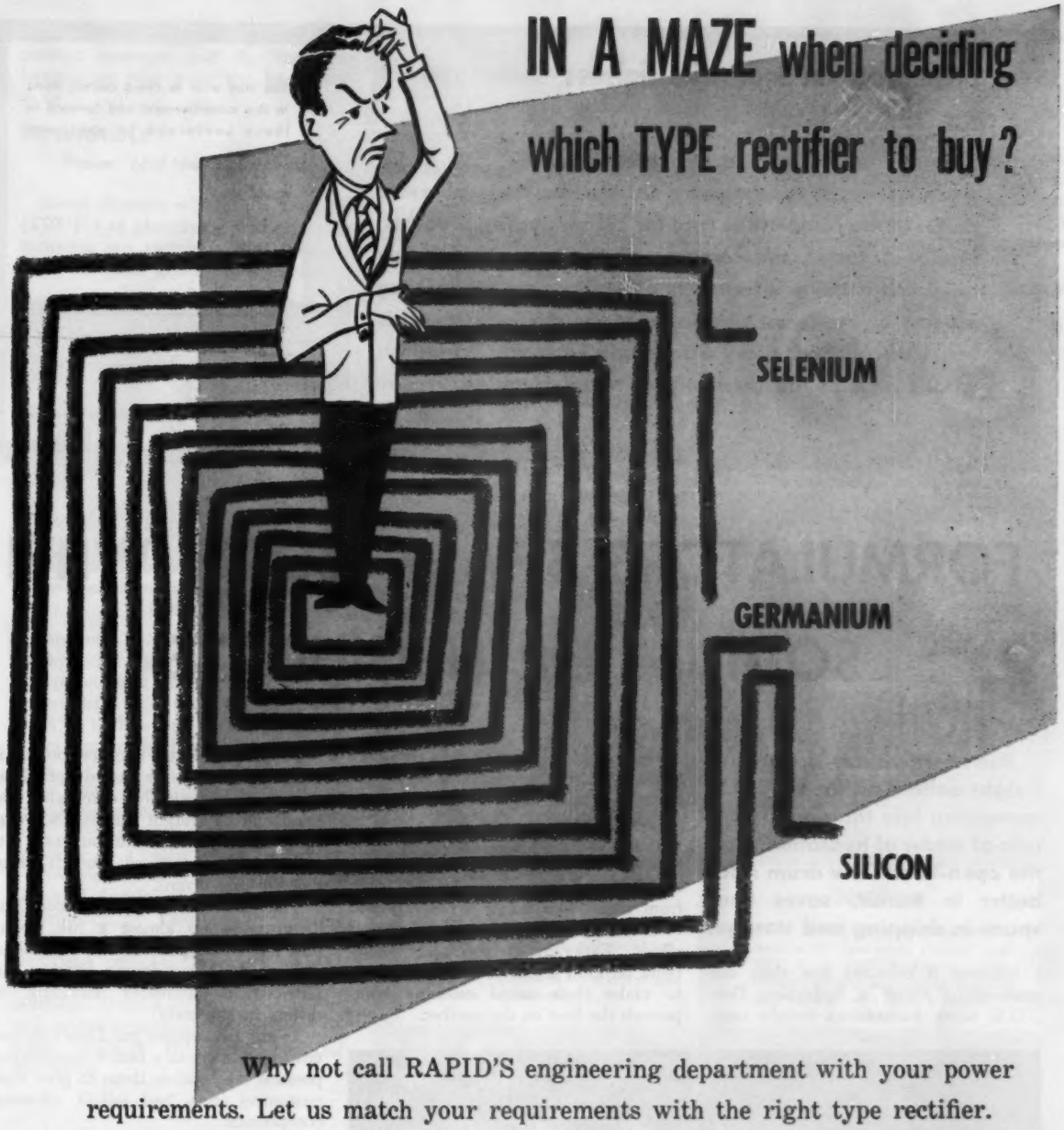
Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.

Branch Offices:
Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.;
Atlanta, Ga.; Dallas, Texas

Related to this field is Aluminum Company of America Patent No. 2,290,364, and possibly others.

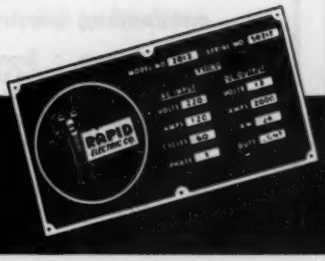
IN A MAZE when deciding which TYPE rectifier to buy?



Why not call RAPID'S engineering department with your power requirements. Let us match your requirements with the right type rectifier.

Because each semi-conductor has advantages to offer, and because RAPID supplies *all three*, you can be certain of obtaining sound technical advice.

Call TA 8-2200 for reliable technical service.



THE NAMEPLATE THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY

12838 Fenkell Avenue • Detroit 27, Mich. • Diamond 1-8537

2881 Middletown Road • New York 61, N. Y. • TAlmadge 8-2200

Head start for industrial finishes

Every step toward faster, safer, more effective metal cleaning heads a company in the direction of extra profit. In the competitive race for higher quality products, produced faster, the company that crosses the "finish line" first is the one that gets a healthy start by keeping abreast of the latest developments in the industry. This series of chemical news reports will keep you posted on what's new in the chemistry of metal cleaning.

You may wish to check certain items in this advertisement and forward to those concerned in your own company.

Route to:

_____

_____

_____

_____

FORMULATORS SHAVE COSTS WITH SODIUM ORTHOSILICATE

Alert formulators are saving freight dollars on Dow's S.O.S. containing less than one molecule of water of hydration. And the open-head Dow drum rides better in transit, saves floor space in shipping and storage.

Because it contains less than one molecule of water of hydration, Dow S.O.S. saves formulators freight costs on every drum. The almost complete absence of water means that freight dollars are spent on S.O.S.—not on unnecessary water.

High acid capacity and high pH of Dow S.O.S. give top cleaning action. Oils, fats and waxes disappear from metal like magic when exposed to the cleaning action of this efficient alkali. Experienced formulators depend on Dow S.O.S. and Caustic Soda to make their metal cleaning compounds the best on the market.

Formulators use Dow Alkalies to make topnotch metal cleaning compounds.

Formulators get another bonus in Dow alkalies—the improved open-head drum. It practically eliminates the headache of freight claims and shipping damage. And formulators find many uses for these smooth-riding, damage-free drums.

The Dow full open-head steel alkali drum takes up almost a full square foot less floor space than conventional drums and has a longer bearing surface which eliminates "climbing" of drums in shipment.

These advantages put Dow's formulator customers in a better competitive position . . . enable them to give *their* customers the best alkali cleaning compounds.

A basic producer of alkali for top quality metal cleaning compounds, Dow is constantly at work improving not only product quality but packag-

Dow chemicals basic to the metalworking industry

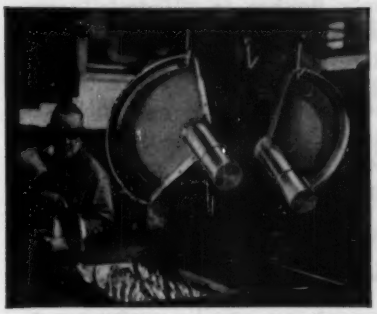
Chlorinated Solvents • Brominated Aliphatics • Alkalies • Ion Exchange Resins • Glycol Ethers • Preservatives • Hydrochloric Acid • Phenolsulfonic Acid • Ammonia • Industrial Glycols • Polyethylene Glycols • Polypropylene Glycols

ing. "Just to be sure," as one Dow product manager put it, "that the formulators who want the best come to us."

DOWANOL:

Passes "acid test" in rust removers

Metal cleaners who use a hot bath (170°F.) of phosphoric acid type rust removers are switching to Dowanol® TPM for their glycol ether solvent.



Dowanol helps rust removers do a better job.

Dowanol TPM (tripropylene glycol methyl ether) gives better solubilizing and penetrating characteristics and, because of its high boiling point (238°C.), does not readily evaporate under extremely high bath temperatures.

In brush and spray rust removal operations, as well as dip baths, Dowanol TPM is helping phosphoric acid removers do a better job at lower cost.

Dowanol TPM is only one of the Dowanol family of glycol ether solvents made by Dow (only company which makes both an ethylene and propylene series). Producer of the widest line of glycol ether solvents available, Dow is in a position to furnish extensive technical information on these products for metal cleaning operations.

★ ★ ★ ★

For more information on any of the chemicals discussed in this advertisement write THE DOW CHEMICAL COMPANY, Midland, Michigan, Chemicals Sales Department 763F.

YOU CAN

DEPEND ON

DOW

CHLOROTHENE:

Puts more solvent power, more safety into cold cleaning

Maintenance cleaning of metal parts calls for a solvent with top cleaning power, maximum safety and little or no residue. And Chlorothene® (Dow 1,1,1-trichloroethane, inhibited) fills the bill.

Plant maintenance men are using this new solvent to get better, safer cleaning in dip, spray and wipe applications. They're cleaning everything from nuts and bolts to big machine tools.

Many plants switched to Chlorothene because management was sensitive to safety factors. But once in use, Chlorothene proved itself as a top-performing cleaner, made other cleaners just plain out of date.

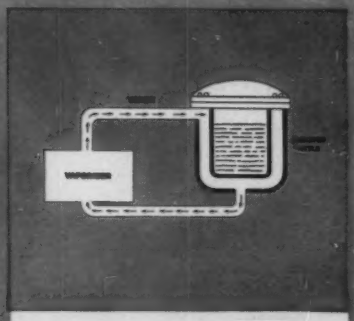
Because it is low in toxicity and has no flash or fire point (flammability characteristics similar to trichloroethylene), Chlorothene is quickly catching on for production cleaning as well as maintenance cleaning operations.

MORE GOOD NEWS

for the metalworking industry

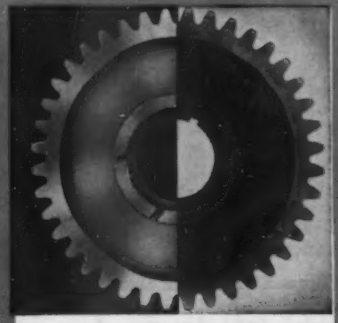
Orthodichlorobenzene

. . . Tops for removal of soft carbon deposits as well as oils and tars. Cost savings possible with water soluble emulsions — formulations available on request.



Dowtherm®

. . . Safer, organic heat-transfer medium for operations ranging from 300° F. to 750° F. Minimizes fire hazards, permits economical, pinpoint heat control, with little pressure!



Trichloroethylene

. . . Now NEU-TRI* (recently added neutral grade) gives Dow customers a full line of solvents to choose from for top efficiency in vapor degreasing.

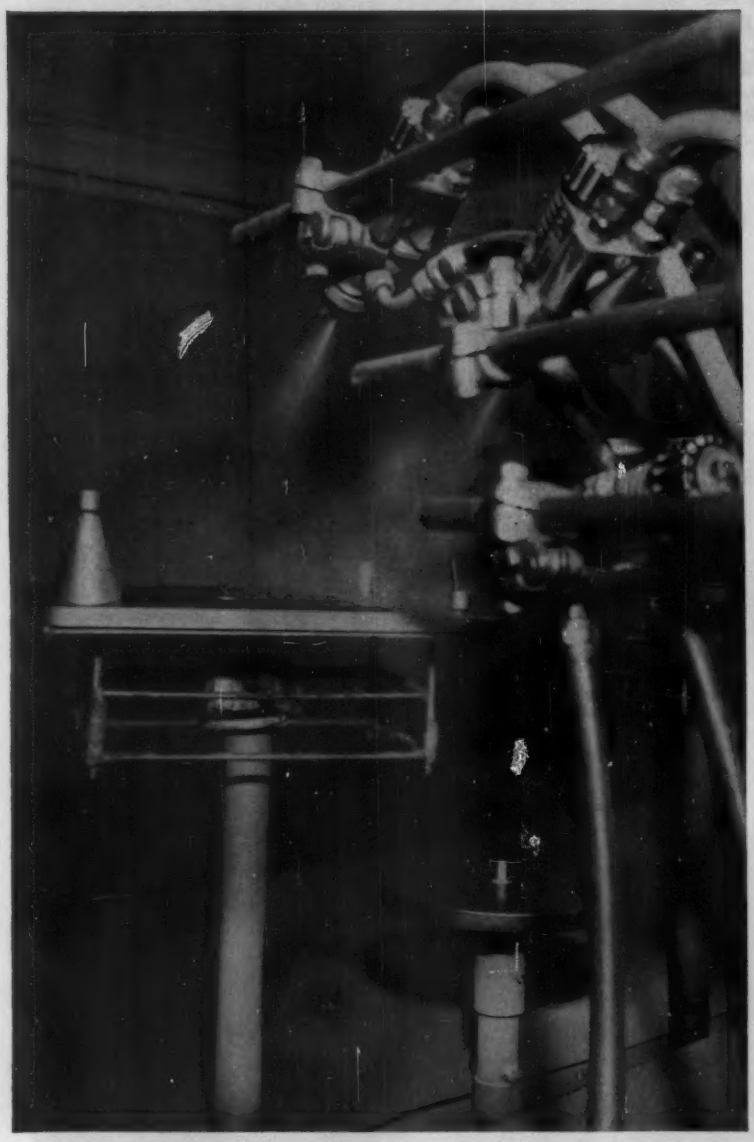
*TRADEMARK OF THE DOW CHEMICAL COMPANY

Dowicide® A

. . . Preservative keeps cutting oils "fresh" and odor-free by preventing growth of bacteria and mold. Makes oil last up to three times as long.

AFTER TRYING VARIOUS FINISHING METHODS . . .

RCA chose "controlled" spray by DeVilbiss Automatics



DeVilbiss chain-on-edge spray machine automatically coats two parts in the same spray booth at the same time with high-level guns applying a bronze metallic paint to motorboards, while a few inches away, low-level guns coat turntables with antique white enamel.

In their search for the best way to apply finishes to "Victrola" components, RCA considered all possibilities.

Their requirements were strict: production rates and quality of finish had to be uniform; material and labor costs lowered; and paint had to be kept off the critical underside area of parts without costly masking or shielding.

The solution: "controlled application" by a DeVilbiss automatic spray system. Now, individual parts move on a DeVilbiss automatic chain-on-edge machine past two spray stations where DeVilbiss automatic spray guns coat them uniformly with controlled paint deposit at speeds up to 600 pieces per hour. Inside the finishing enclosure air is circulated and cleaned by a DeVilbiss air-replacement system to eliminate flaws from air-borne dust and dirt.

Management of RCA's Cambridge, Ohio, Plant has indicated that the new DeVilbiss setup has saved 35% in material, 60% in labor; cut rejects from 20% to less than 1%; given a uniform and quality finish. The equipment is expected to pay for itself in the first 12 months of operation.

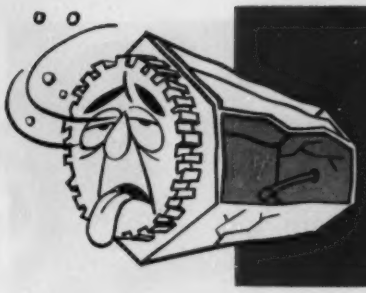
Why not call your nearest DeVilbiss branch office today and see how "controlled application" can solve finishing problems not possible by other methods.

THE DEVILBISS COMPANY, Toledo 1, Ohio

Barrie, Ontario • London, England • Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY

DEVILBISS



"DON'T GET CAUGHT WITH YOUR PLANTS DOWN!"

Have UDYLITE *repair, replace plating barrels NOW...at low cost!*

Get ready today for tomorrow's upswing in business! Have your plating facilities geared to peak performance . . . avoid the risk of costly down time during peak periods of production. Take inventory of your equipment needs . . . and the condition of your plating barrel equipment. Then let your Udylite sales engineer give you on-the-job quotations for repairs or replacements. When your equipment is sent to Udylite . . . you are guaranteed a definite return delivery date. A special department handles your order all the way through . . . costly down time is kept to an absolute minimum.

REPAIRS OR REPLACEMENTS BY UDYLITE OFFER THESE ADVANTAGES:

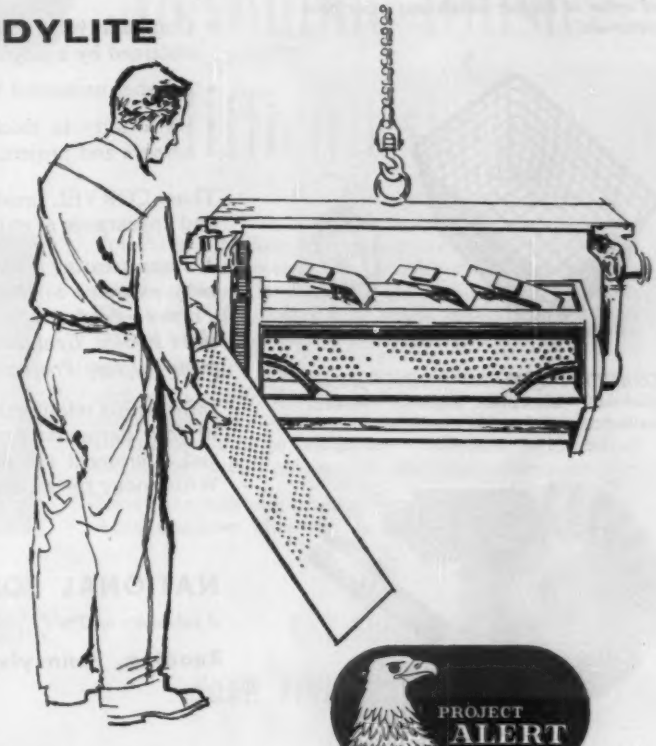
1 IMMEDIATE QUOTATIONS given by Udylite salesman right in your shop!

2 ALL REPAIRS or REPLACEMENTS WITH GENUINE UDYLITE PARTS! You're assured of finest Udylite engineering, highest quality!

3 PARTS FACTORY INSTALLED by trained barrel equipment specialists.

4 FAST, GUARANTEED DELIVERY of equipment sent to Udylite. Special department set up to expedite your order.

Let Udylite help you get your entire plating operation in top working order, ready to go at top capacity. Your Udylite sales engineer will soon be calling on you. But if you need priority service write, phone or wire directly to:



PROJECT ALERT

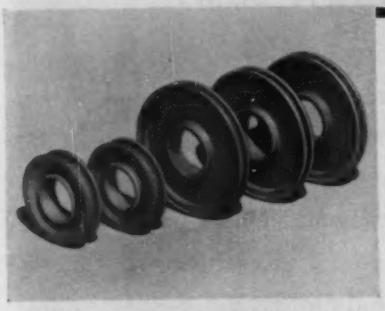
the udylite corporation

detroit 11, michigan • world's largest plating supplier

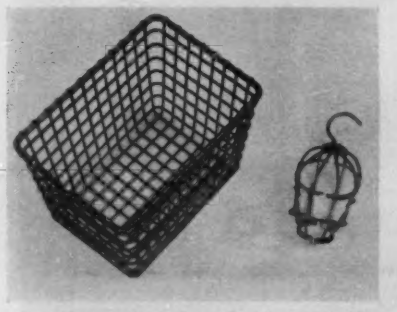
CORVEL Cellulosic Finishes—wide variety of colors with high surface gloss; excellent retention of both color and gloss in water, salt spray, sunlight.

CORVEL Vinyl Finishes—durable with extreme toughness; resistant to corrosion and most chemicals. Available in a range of colors.

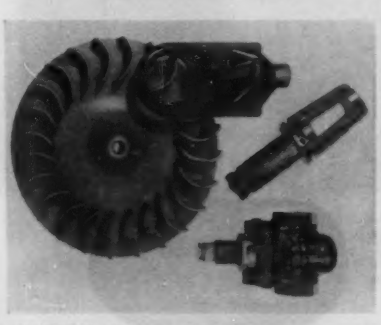
CORVEL Epoxy Finishes—excellent insulation at elevated temperatures; moisture, chemical and impact resistant. Provide a hard, smooth surface.



CORVEL Nylon Finishes—to impart the outstanding wear and low frictional qualities of nylon in coating metals and other base materials.



CORVEL Polyethylene Finishes—provide zero water absorption, excellent chemical resistance and electrical insulation.



CORVEL K-51 Penton Finishes—exceptional chemical and wear resistance. K-51 Penton finishes can withstand temperatures from −40° F. to 250 F.*

*Trademark of Hercules Powder Co.

CORVEL† Fusion Bond Finishes—

Six new engineered resins for product finishing

CORVEL finishes are specially processed dry powders, formulated for use in the patented** fluidized bed coating process. These finishes give you the following outstanding advantages:

- Comparatively heavy finishes (from approximately 0.005″ to 0.062″) obtained by a single dipping treatment—*without* the use of solvents.
- Finishes unmarred by sags, drips or bridging.
- Uniformity in thickness, with excellent coverage of sharp edges, corners and projections.

Thus, CORVEL finishes can give your products improved durability and appearance at minimum cost, and provide new design possibilities.

Process licensing is now readily available. A process license is automatically extended to the purchaser of CORVEL powders from National Polymer Products, Inc. upon payment of a small royalty added to each sales invoice. General licenses to use the patented process are available from Polymer Processes, Inc., an affiliate company.

Information relating the advantages of CORVEL Fusion Bond Finishes, to your particular products and details on the fluidized bed process and equipment are available from National Polymer Products, Inc. Write today for a copy of the new CORVEL Bulletin.

NATIONAL POLYMER PRODUCTS, INC.

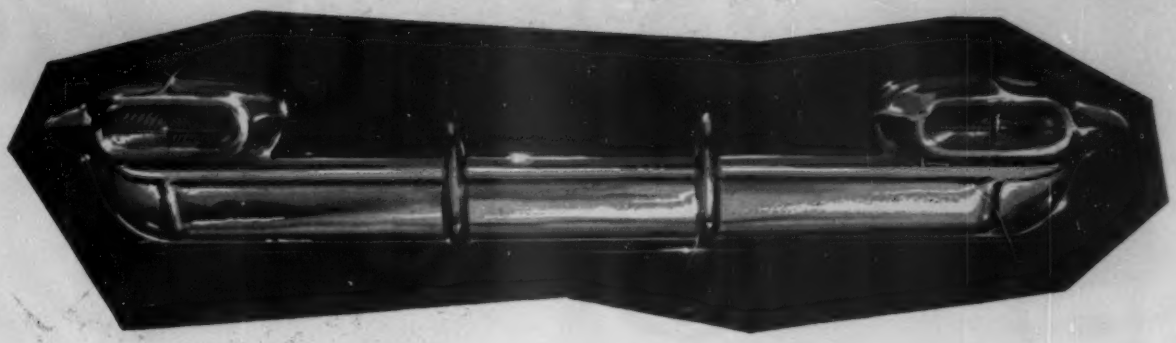
A subsidiary of The Polymer Corporation

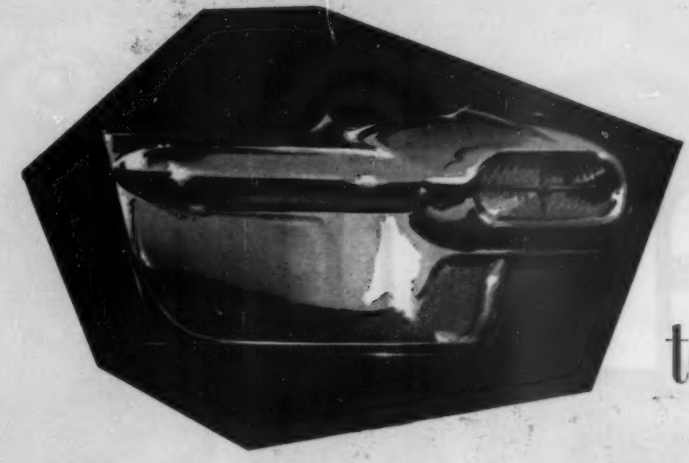
Reading, Pennsylvania

POLYPENCO

†*Polymer Corporation trademark for finishing materials*

**U. S. Patent 2,844,489 and over 30 patents pending





Acme designs custom setups to volume-finish difficult shapes

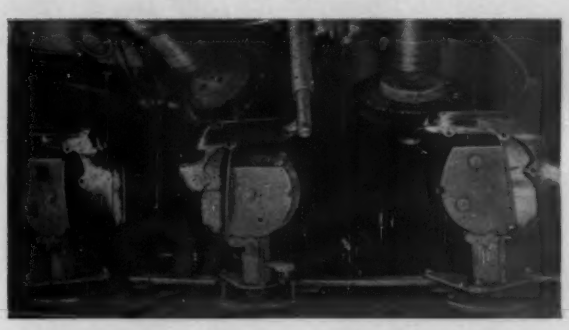


Photo shows three of twenty-one operations on Acme machine for finishing all contours of auto bumper part. At each station, part is automatically positioned and buffed by 20-hp floating-head lathe.

Polishing or buffing difficult contours on a volume basis can only be a successful and economical operation when the equipment is designed for the job—by experts. That's why, for nearly fifty years, manufacturers have turned to Acme-designed equipment.

Skilled Acme engineers receive the problem-product and, with *standard* units and a wide variety of accessories, design a *custom* machine to do the complete job. Each model change brings new challenges, yet much of the Acme equipment can be used year after year.

Next time finishing problems come up, give them to an Acme engineer. He's used to them.

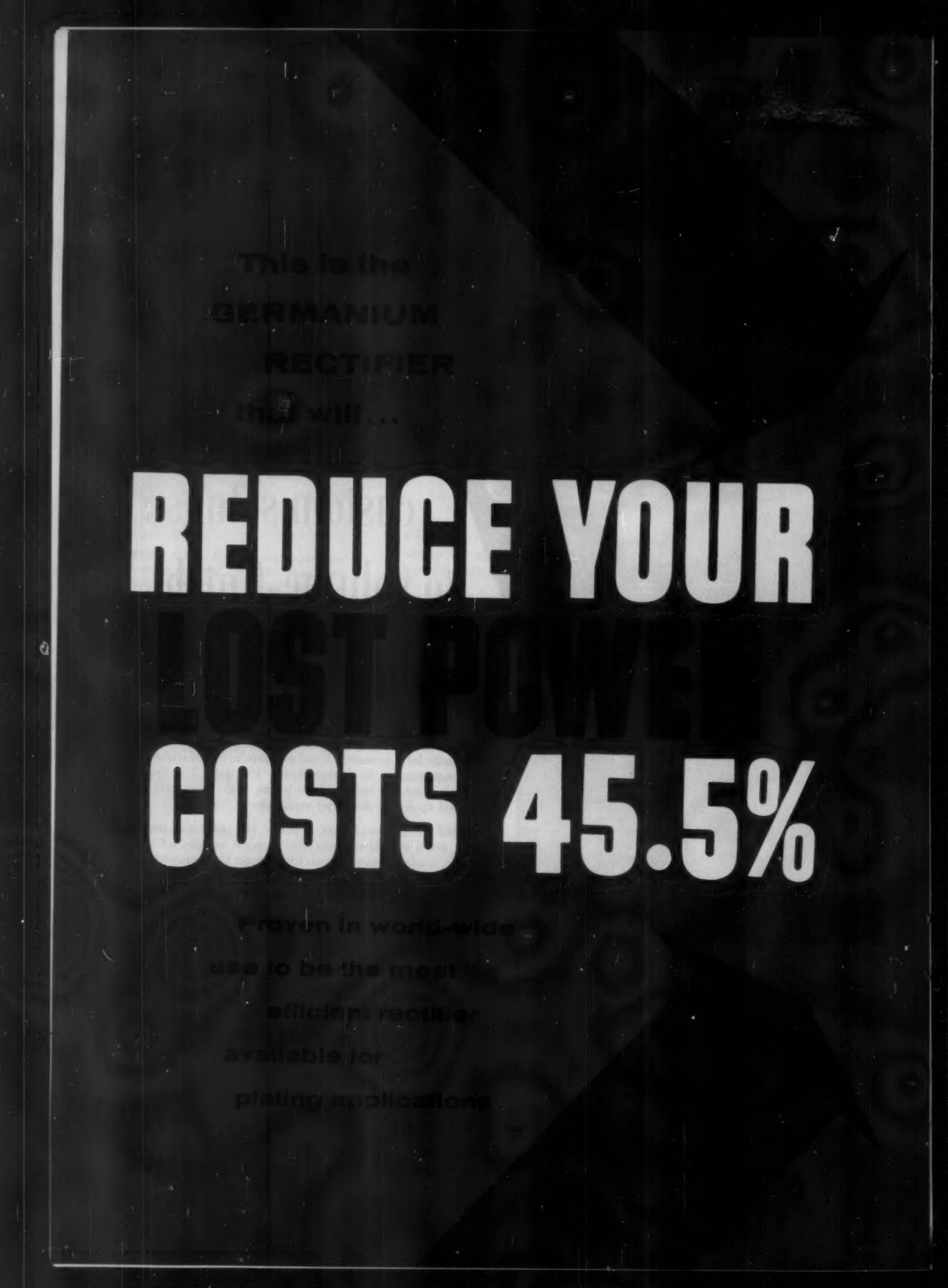
LET ACME *Polish Off*

YOUR FINISHING PROBLEMS

ACME MANUFACTURING COMPANY

1400 E. 9 MILE ROAD, DETROIT 20, MICHIGAN

LEADING PRODUCERS OF AUTOMATIC POLISHING AND BUFFING EQUIPMENT SINCE 1910


This is the
GERMANIUM
RECTIFIER
that will ...
REDUCE YOUR
COSTS 45.5%
Proven in world-wide
use to be the most
efficient rectifier
available for
plating applications

Of all semiconductor types...

the Germanium Rectifier features

the lowest voltage loss!

This factor alone can mean real year 'round power savings in your plating operation! For Example: Operating ten hours a day, six days a week, 10,000 ampere rectifier power supply will save 312 KWH per week over a silicon unit of the same rating... an annual saving in power dollars amounting to $948.48! Above figures are based on an estimated national average cost of 3.9¢ per KWH. If you pay more, you'll save more!

WHEN YOU BUY A POWER SUPPLY – BE SURE IT CONTAINS THIS RECTIFIER JUNCTION.

Produced for Leading Equipment Manufacturers by

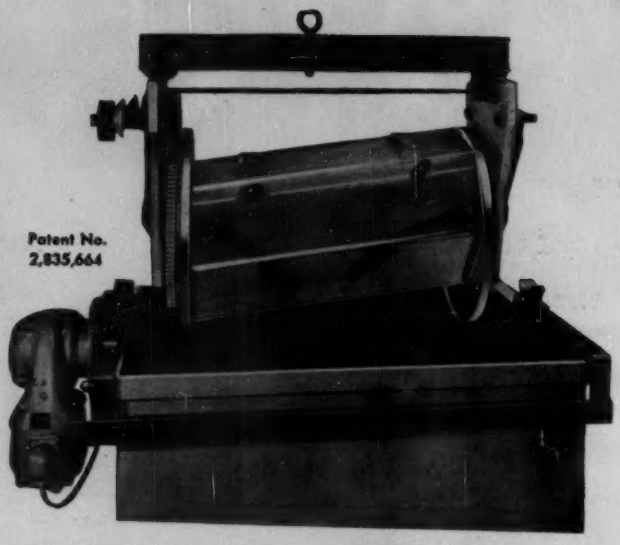
International Rectifier Corp.

INTERNATIONAL RECTIFIER CORPORATION • EXECUTIVE OFFICES: EL SEGUNDO, CALIFORNIA • PLANTS: OREGON • AZUSA • NEW YORK • CHICAGO • SAN FRANCISCO • DETROIT • PHILADELPHIA • BOSTON • ATLANTA • DALLAS • TORONTO, ONTARIO • MEXICO CITY

WORLD'S LARGEST SUPPLIER OF INDUSTRIAL METALLIC RECTIFIERS • SELENIUM • GERMANIUM • SILICON

Oscillating Cylinder Prices Reduced

14x30 and 14x36 Double Oscillating Cylinders are now same price as ordinary cylinders



Patent No. 2,835,664

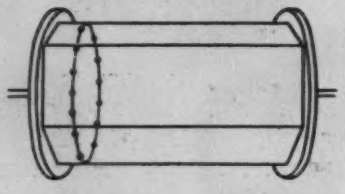
How Oscillating Cylinders Improve Plating and Cut Costs!

Double Oscillating Cylinders rock as they revolve. The Rocking Action adds *side motion — moves the work back and forth across the cylinder from end to end in a progressive figure 8 mixing pattern as shown by the diagrams below.*

The improved mixing action combined with movement of the pieces across the cylinder *exposes all sides of every piece equally to plating current for uniform distribution of plate.*

Uniform Distribution of Plate

Conventional Cylinder



As the cylinder revolves the marked piece follows a fixed path round and round the inside wall.

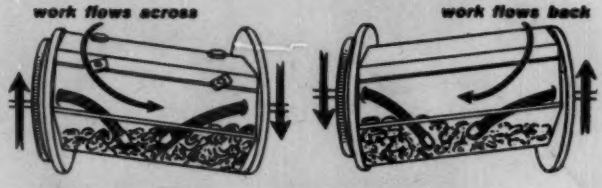
Double Oscillating Cylinder

The marked piece shows the progressive figure 8 mixing action added by double oscillation. The work pours back and forth as well as round and round.

Individual pieces move from end to end of the cylinder. They roll, twist and turn. None remains buried.

All sides of every piece are uniformly exposed to plating current. *That's why Double Oscillating Cylinders give you uniform plating deposit not obtainable with conventional cylinders, in less plating time and at reduced plating cost.*

Oscillating Cylinders Rock as they Roll



Uniform Distribution of plate produces a specified thickness in less time

Why! Because you do not have to overplate most of the work to get the specified thickness on all faces of all pieces — You have improved plating quality with less under plating and less over plating — avoid complaints, eliminate rejects, stripping and re-running.

Results on hard-to-plate work demonstrate the difference

The triple mixing action of Double Oscillating Cylinders has revolutionized the plating of washers, flat pieces and other shapes that stick together, including much work that otherwise had to be wired. This same mixing action, *by providing uniform exposure to plating current,* assures more uniform deposit on all barrel plating work.

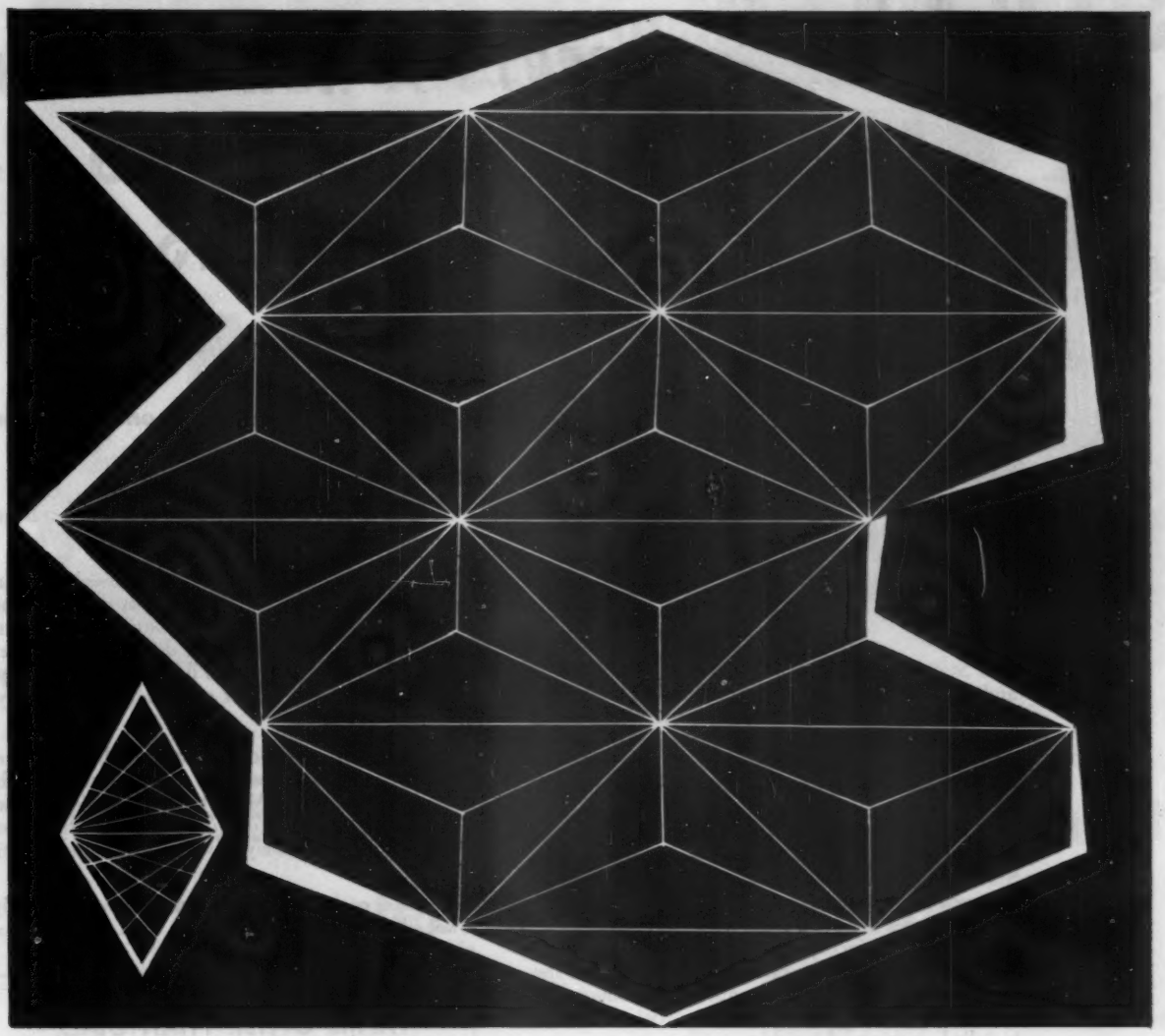
Interchangeable with other makes

BELKE Double Oscillating Cylinders can be furnished for use in the same tanks with conventional cylinders of other makes. Whether you need new plating barrels or replacement cylinders you can have the full advantage of double oscillation and at no extra cost.

Write today. Just tell us what you need for complete information.

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51

EVERYTHING FOR PLATING PLANTS



FOR DYEING
OF CHROMIC ACID
ANODIZED ALUMINUM...

SANDOZ

SEE SANDOZ

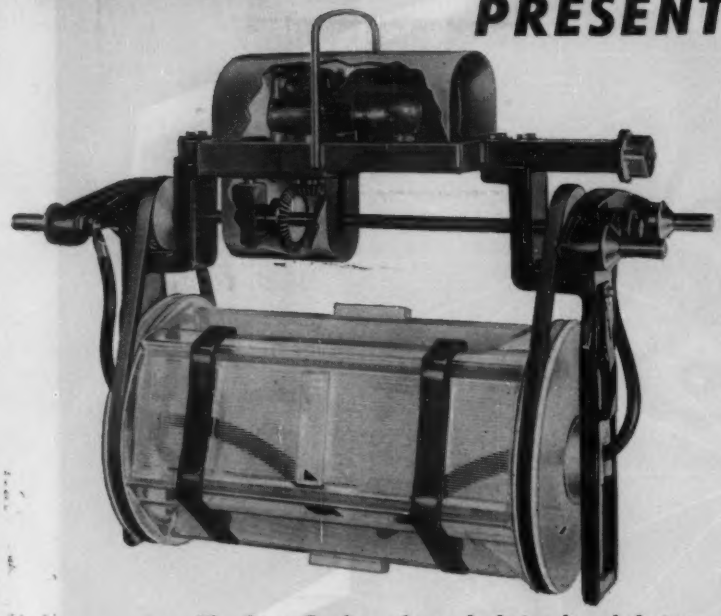
Sandoz at your service! If you are putting through a chromic acid job to meet government specifications right now, or if you are contemplating a new shade or a new application, drop a note to the Sandoz Application Laboratory for an accurate recommendation of colors or coloring procedures.

And if you have not already received a copy of Sandoz Bulletin A-710, "*Recommended Dyes For Coloring Chromic Acid Anodized Aluminum Alloys*", mention it. We will be happy to send it along.

SANDOZ, INC., 61-63 VAN DAM STREET, NEW YORK 13, N. Y. ALGONQUIN 5-1700

STUTZ—

PRESENTS A NEW DESIGN in PLATING BARRELS—



Featuring

Motor drive integrally mounted

Complete cycle

Continuous rotation from one operation to the next

Cog belt cylinder drive

Positive grip one piece outboard mounted cog pulleys

The motor-combined unit shown affords special economy since drives on tanks are not required, and rotation of the cylinder can be continued from one operation to the next. Solution dragout is therefore reduced to a minimum. This design is ideal for application on the carriers of a full automatic conveyorized plating machine.

The motor drive to the countershaft is through bevel gears operating in a gear case and permanently lubricated. Standard R.P.M. of the cylinder is 5; however other speeds are obtainable at no extra cost. Hangar arms completely covered with fused plastisol.

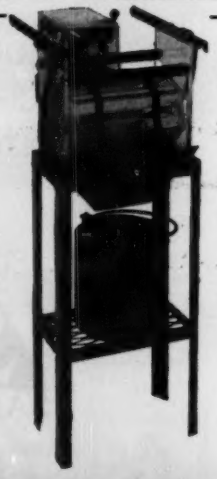
The initial cost of belt driven units is substantially lower than gear driven barrels, and maintenance virtually eliminated.

The Stutz Co. has advanced plating barrel design and construction so that today these units are highly productive and maintenance reduced to a minimum. Costly replacement parts such as cylinder gears and bearings are eliminated completely. The only expendable parts are the belts. To provide long belt service, a special non-stretch cog belt with internal steel reinforcement is used. Belts can be changed, if necessary, in seconds at the tank without tools. The Stutz hanger extends below the cylinder thereby adding protection to the cylinder and also permitting the assembly to be lowered to the floor. The Stutz assembly incorporates a lock-in design that permits removal of the cylinder instantly from the hangers without the use of tools. This means cylinders with special perforations or partitions can be installed or removed quickly.

ALSO ADAPTABLE FOR TANKS OTHER THAN OURS.

STUTZ PORTABLE PLATING BARRELS

The Stutz Portable Barrel is made in 3 standard sizes with cylinders having inside dimensions of 6″x12″, 8″x18″ and 10″x18″ I.D. Smaller upon application. Standard openings are 3/32″. Smaller or larger openings can be furnished as required.



★ ***Baskets in perforated metals or wire mesh.***

★ ***Load/Unload Stand for convenient and fast handling of work load.***

Write for Catalog and Prices ***We Invite Your Inquiries***

THE STUTZ COMPANY
4430 West Carroll Ave., Chicago 24, Illinois

Complete Metal Finishing Equipment and Supplies

Wyandotte's amazing new development for steel electrocleaning!

Never before an electrocleaner like this! New MAXAMP delivers a new high in performance; brings you outstanding efficiencies never before possible.

MAXAMP's new and greater conductivity and maximum detergency handle those really tough jobs: stubborn smut, buffing and polishing compounds; phosphate coatings from drawing operations. Cleaning results are remarkable — your plating is mirror bright and stain free!

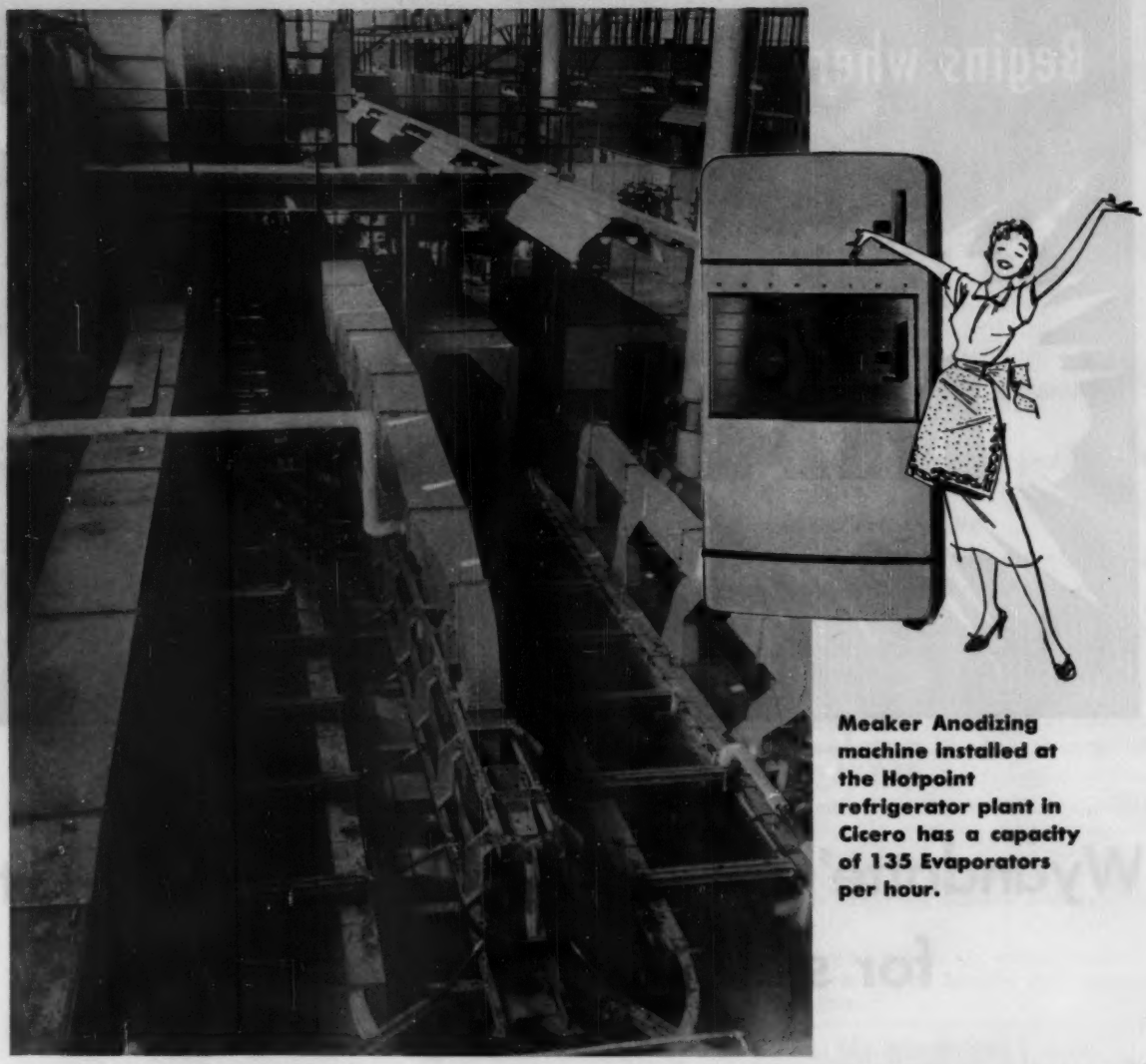
MAXAMP gives unequaled performance in handlines and automatics. Also important: MAXAMP is anhydrous, which means you buy *all cleaner*, no built-in water. Gives maximum results with minimum concentrations. And there's ideal foam control—no explosions, yet keeps fumes from escaping.

So, if you're interested in more efficient electrocleaning operations—and who isn't?—it'll pay you to investigate MAXAMP. It's the "new king of steel electrocleaners!" Call your Wyandotte representative for a demonstration, today! *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION

THE BEST IN CHEMICAL PRODUCTS FOR METAL FINISHING



Meaker Anodizing machine installed at the Hotpoint refrigerator plant in Cicero has a capacity of 135 Evaporators per hour.

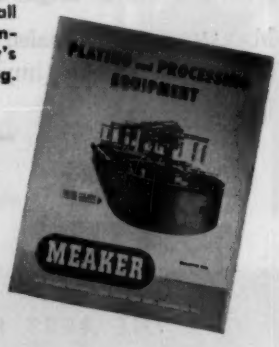
MEAKER helps HOTPOINT meet new trend toward lighter Anodized Metals

Engineered and designed as an integral part of Hotpoint's production line, **this Meaker Anodizing machine is used for the complete anodizing process.** It was expressly developed to handle various components and difficult to drain refrigerator parts such as deep, box-like "evaporators." Carrier arms in this case were engineered to raise to a 30° angle assuring complete pour-out of liquid and eliminating the carryover of fluids from one tank to another.

Meaker engineers think like plant engineers and it's this kind of detailed thinking that has helped Hotpoint solve many other plating problems and produce a finer end product at the lowest possible cost. On your next metal finishing problem, call Meaker—**this experienced company can show you tomorrow's ideas for plating and processing.**

MEAKER
METAL FINISHING EQUIPMENT

for detailed information on Meaker equipment write for free Bulletins, c/o Dept. A. D.



The Meaker Company *1629 South 55th Avenue, Chicago 50, Illinois*

Metal Finishers, Inc., uses Mutual Chromic Acid in its "Mecrome" plating of cylinder liners. Each liner is examined with a microscope (above). Microphotograph shows uniformity of pockets which retain lubricating oil.

Combine your plating skill with high quality Mutual Chromic Acid

For longer-lasting, more uniform chrome wearing surfaces..

Uniform porous chrome plating in cylinder liners can increase cylinder life up to five times. To get this uniformity requires plating skill *and*—high quality Mutual Chromic Acid.

Mutual Chromic Acid is always 99.75% pure—or better. Sulfate content never exceeds 0.1%, permitting closer control of the acid-sulfate ratio in the bath. This is one reason why many of the country's leading platers specify Mutual Chromic Acid.

A booklet, "Mutual Chromium Chemicals," offers information on chromic acid and other Mutual products. Just mail the coupon for your free copy.

Mutual chromium chemicals

Sodium Bichromate
Sodium Chromate
Chromic Acid
Potassium Bichromate
Potassium Chromate
Ammonium Bichromate

SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N.Y.

Allied Chemical

MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast.

Solvay Process Division
Allied Chemical Corporation
61 Broadway, New York 6, N. Y.
Dept. 9-11

Please send me Bulletin #52—"Chromium Chemicals."

NAME_____ TITLE_____

COMPANY_____

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Rx TREAT ALUMINUM RIGHT with these proven AHCO Compounds

Rx Lustralume No. 1

This outstanding new burnishing compound is a clear stable liquid readily soluble in water. It's non-toxic, non-flammable, mildly alkaline, and moderate foaming. Ideal for use in all conventional types of oblique or horizontal barrels where moderate foaming is permissible. Solutions are free rinsing and leave no undesirable films on the work. Properly cleaned surfaces emerge with a smooth brilliant lustre.

Rx Ahcal Deoxidizer

This compound is ideal for removing smut after cleaning and etching, and before painting. Its convenient powdered form make it safer than liquid acids and it gives off no dangerous or toxic fumes.

Rx Ahcal Etch Cleaner No. 1

This powdered, concentrated, alkaline material produces an attractive, uniform etch in a very short time on all types of aluminum surfaces. It's non-dusty and its solutions produces the right amount of foam. The outstanding characteristic of Ahcal is its ability to dissolve large quantities of aluminum without forming undesirable scale or sludge. As a result maintenance problems are eliminated or alleviated.

Rx Ahcoloid Cleaners

No. 189—A non-etching alkaline soak cleaner for cleaning aluminum prior to anodizing and chemical processing.

No. LC-3—An emulsifiable liquid pre-cleaner . . . ideal for removal of oil, grease, and buffing residues from aluminum. It's non-corrosive and non-toxic.

No. 59-H-5—A non-etching alkaline cleaner for use in power washers. It's low foaming and has exceptional cleaning power.

LUSTREBRITE LIQUID 35—A new type of liquid soak cleaner developed specifically for removing buffing compound residues and fingerprints. It's an aqueous solution of non-toxic, non-corrosive, organic materials. It has no flash or fire point and it's non-fuming.

Write for Bulletins to

Hubbard Hall

APOTHECARIES HALL CO.

DIVISION OF

THE HUBBARD-HALL CHEMICAL CO.

WATERBURY, CONN.

The Answer to your toughest tank lining problems

TYGON

flexible – plastic

•

TOPS IN CORROSION-RESISTANCE

PROVEN in hundreds of the toughest possible applications during the past eighteen years, flexible Tygon plastic tank linings offer more value today than ever.

Greater toughness; even better chemical resistance, particularly to chromic and other highly oxidizing acids; longer life.

This better Tygon lining (Formulation 105-A) represents a major step forward in the development of heavy duty plastic sheetings for corrosive service. Tygon linings are now extruded, not calendered. They are completely free of "laminations" — cannot "peel" in service. Under continuous immersion these better Tygon linings show negligible extractibility.

Available in 3/32" and 3/16" thicknesses, Tygon can be installed by strategically located licensed applicators quickly and inexpensively.

For that next "tough" tank lining problem — ask for, insist on — TYGON.

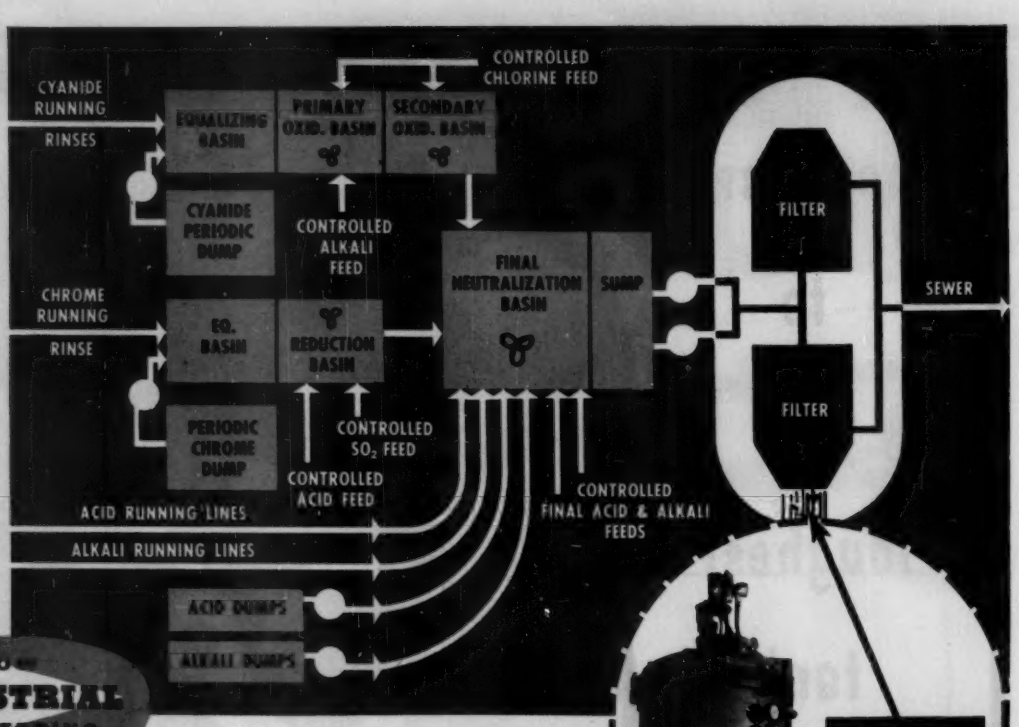
311F

This booklet tells the "down-to-earth" facts about Tygon. Where and how to use it. When not to use it. A valuable reference for every engineer faced with corrosion problems. Free on request. Write for your copy today! Ask for Bulletin TL-526-R. Address: Plastics & Synthetics Division, The U. S. Stoneware Co., Akron 9, Ohio.

U. S. STONEWARE

AKRON, OHIO

Tygon is the registered trade-mark of The U. S. Stoneware Co.



SIMPLE, FAST CAKE DISPOSAL

There's no mess, no time lost with this rapid-cleaning INDUSTRIAL filter. A simple mechanical shaker discharges the *dry* cake through the convenient bottom outlet—directly into a waiting disposal truck that can be driven away immediately.

INDUSTRIAL ENGINEERING PAYS OFF

Cutting Costs on Plating Waste Disposal

A large midwest plant needed an efficient centralized system for disposal of corrosive wastes from several plating lines.

The answer to their problem was the INDUSTRIAL *engineered system* diagrammed above. This system provides a central basin for neutralization of all the acid, alkali, cyanide and chrome wastes delivered from rinsing operations. Only small amounts of chemicals are added to precipitate the dissolved metals for separation by filtration. The two compact INDUSTRIAL filters extract the solids and discharge a neutral non-toxic effluent to the city sewage system.

The end results reduced equipment costs by one-half—two push-button Vertical Leaf Filters *replace* expensive clarifier mechanisms, sludge pumps and vacuum filter! . . . 90% LESS SPACE required for entire system! . . . SIMPLE INSTALLATION—no excavation or complex concrete work! . . . DRY CAKE WASTE DISPOSAL—discharged by mechanical shakers directly from filters into trucks!

INDUSTRIAL

INDUSTRIAL FILTER & PUMP MFG. COMPANY
5906 Ogden Avenue, Chicago 50, Illinois

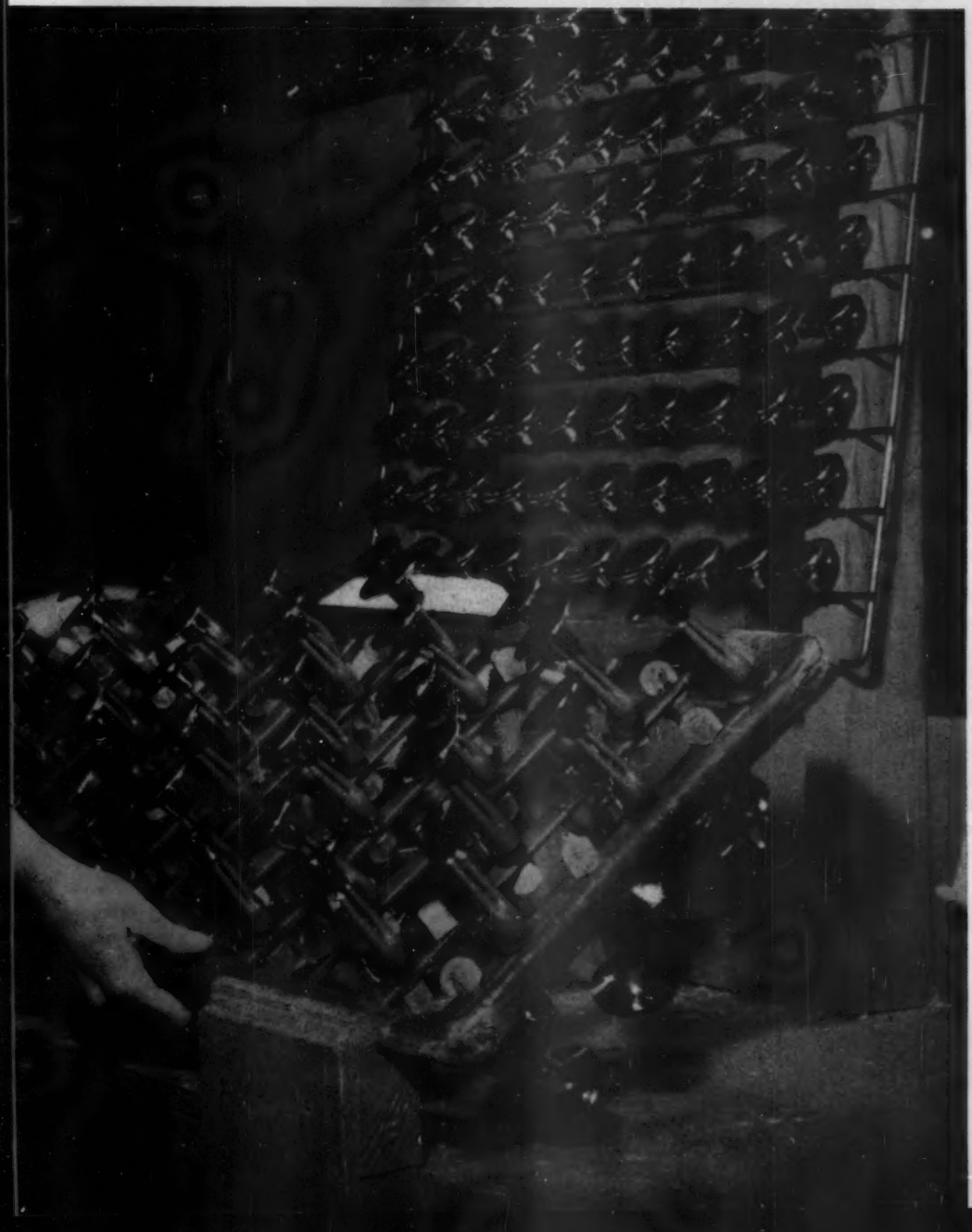
Call or write INDUSTRIAL to find out how an engineered system like this can solve your specific plating waste and recovery problems.

F-358

PRESSURE FILTERS ◆ ION & HEAT EXCHANGERS ◆ WASTE-TREATING EQUIPMENT

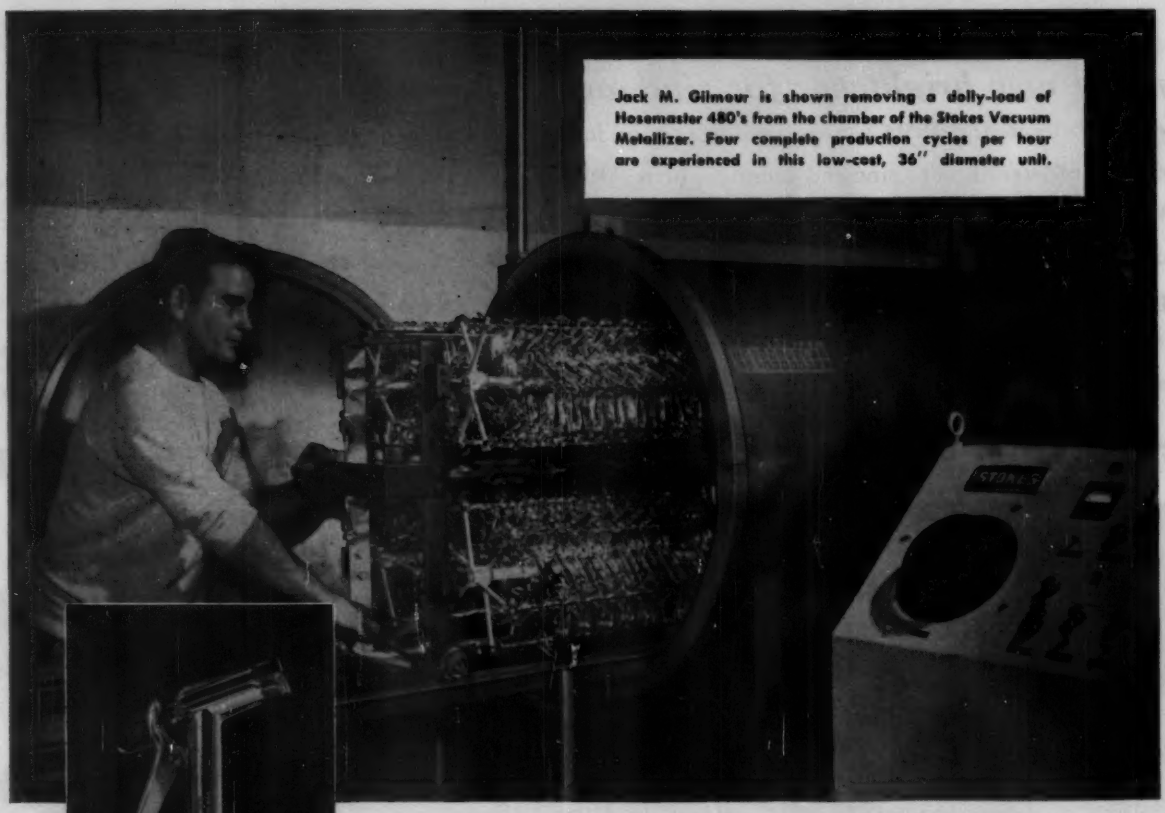
Unique new brightener for zinc and cadmium plated parts **has been developed by Federated: CONMAX, a conversion coating for plated finishes from brilliant to iridescent, provides corrosion resistant film to zinc and cadmium plate. Other high quality, low-cost brighteners from Federated: ZIMAX for all types of zinc plating, still, automatic, and barrel; CADMAX for cadmium plating; NIMAX, highly concentrated brightener for nickel barrel plating. These brighteners undergo rigid competitive tests before approval for sale. This also applies to Federated's complete line of plating anodes and nickel salts. It's safest when you specify plating supplies from Federated Metals Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. In Canada, Federated Metals Canada, Ltd., Toronto and Montreal.**

FEDERATED METALS DIVISION OF



ASARCO

AMERICAN SMELTING AND REFINING COMPANY



Jack M. Gilmour is shown removing a dolly-load of Hosemaster 480's from the chamber of the Stokes Vacuum Metallizer. Four complete production cycles per hour are experienced in this low-cost, 36" diameter unit.

Gilmour Hosemasters given lasting finish in Stokes Vacuum Plating Chamber

Gilmour Manufacturing Co., Somerset, Pennsylvania, is the world's largest maker of pistol-grip hose nozzles—the Hosemaster line. Their Model 480, for example, is leak-proof and clog-proof, with a tooled all-brass valve arrangement . . . has a lifetime metallic finish on the body, put there in a Stokes Vacuum Plating Chamber.

Vacuum metallizing can give a distinctive gold, brass, copper or chrome finish at a cost considerably lower than electroplating . . . making it possible to offer smart, modern tools at low, competitive prices. It also enables plating of non-conductive materials . . . and bright lasting finishes that must withstand weather and other abusive environments.

Interlocked centralized controls on the Stokes systems make it easy for employees to learn operating procedures and routine—and to produce consistently high standards with minimum labor. The equipment, itself, is compact and self-contained . . . requires little floor space.

Investigate this modern, low-cost method for finishing metals or plastics. Stokes can give you practical help in over-all planning . . . to determine plant layout as well as production techniques, rates and costs . . . to select materials and auxiliary equipment . . . to train your operators. Contact your nearest Stokes office, or write for additional data on Stokes Vacuum Metallizing equipment.

Vacuum Equipment Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

Completely automatic, unattended unloading end of the Stevens Automatic Barrel showing control panel and rectifier site located above machine.

Unistrut says— "COSTS 50% LOWER— FINISH BETTER with . . . STEVENS AUTOMATIC BARREL MACHINE"

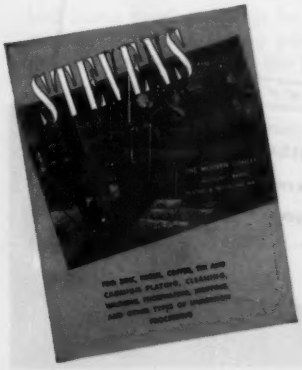
Every day in the Unistrut Corporation plant, Wayne, Michigan, thousands of small parts are zinc plated and shipped to Unistrut warehouses throughout the United States. All of these parts are zinc plated automatically by a Stevens Automatic Barrel Machine.

Unistrut high standards require a uniformity of plate on the parts used in their metal framing systems. But since installing the Stevens Automatic Barrel they have reported other advantages as well—"less handling, smaller inventories and quicker shipments." When you consider the 50% cost savings of actual plated parts too, it all adds up to a terrifically profitable investment.

Why don't you tell us your metal finishing problems and let us make recommendations. There's no obligation.

Side view of machine showing excellent drainage system.

Plating section of machine with ventilating duct work.



Write today for your copy of the 1958 bulletin, "The Modern Concept . . . Stevens Automatic Barrel Processing and Plating Machine." Write to Frederic B. Stevens, Inc., 1800 — 18th Street, Detroit 16, Michigan.

STEVENS 75 YEARS OF SERVICE

FREDERIC B. STEVENS INCORPORATED

YOUR METAL FINISHING SUPERMARKET

DETROIT 16, MICHIGAN

ATOMEX®
IMMERSION GOLD SOLUTION

gives you
4 PLUS FACTORS

1. EXTRA DENSE. Atomex can be used on a wide variety of base metals and has been used for electroplating many different items. It deposits an *extra dense* coat so that the same appearance can be achieved with 30% less gold.

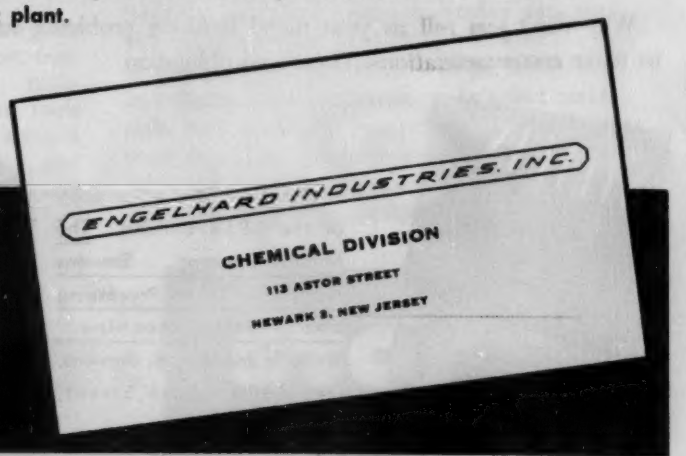
2. UNIFORM DEPOSIT. Since there can be no electrical shielding, there are no low or high density areas — all parts of the object, even blind recesses, receive a *uniform deposit.*

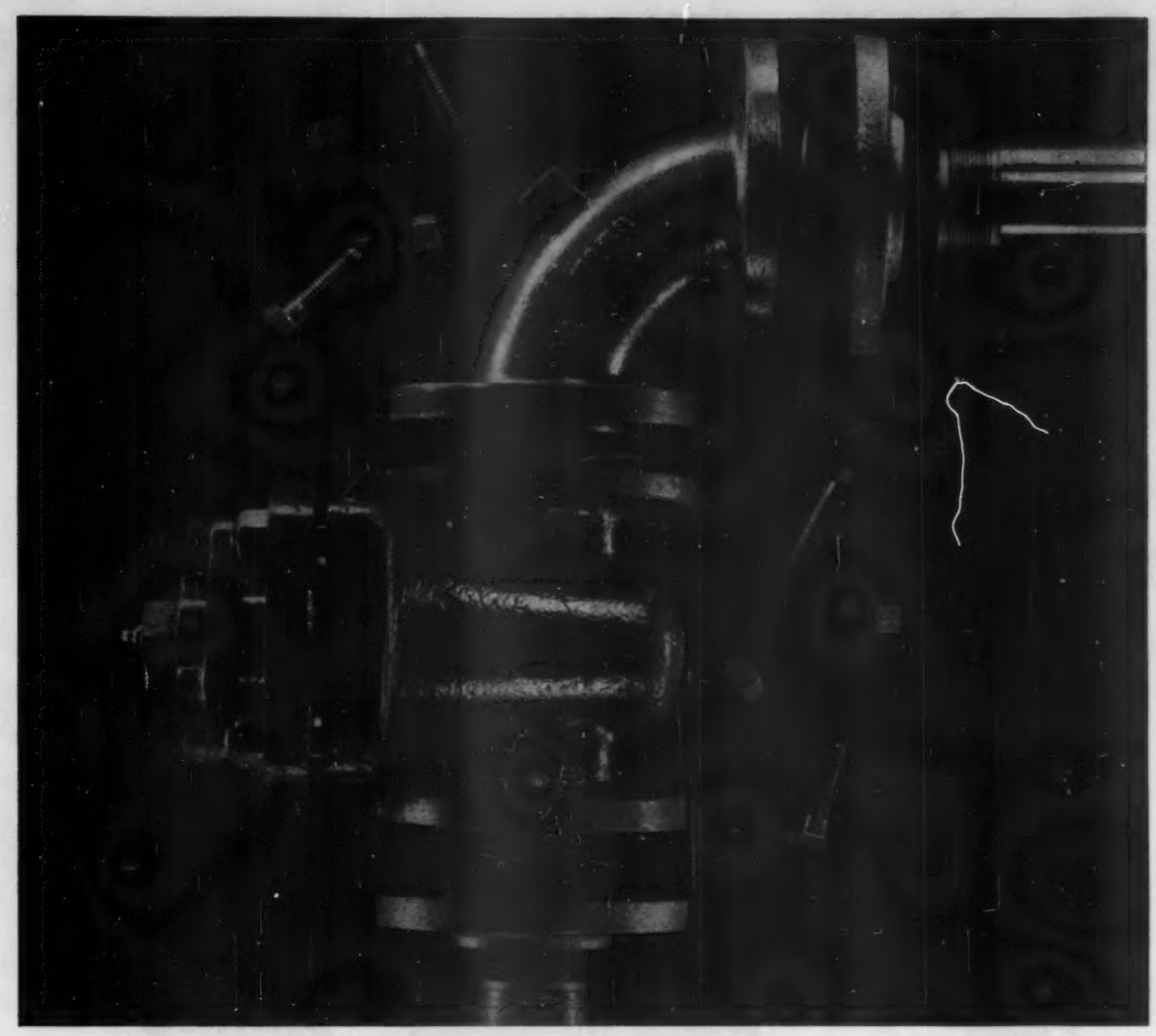
3. EASE OF CONTROL. No *analytical control* of the bath is necessary because there is no free cyanide or carbonate buildup. Small operators no longer will have to hire consultants to check baths.

4. SAVES TIME. All the gold in the bath can be consumed. The spent solution is thrown away, rather than sent back to the manufacturer for refining. *Saves valuable time in many electroplating operations.*

These four major advantages, plus the ease of operation and simple controls make Atomex a valuable adjunct to any electroplating plant.

Investigate **ATOMEX** *for your gold electroplating needs*





You can see why Saran lined pipe cuts operating costs

These corrosion-resistant pipes, fittings and valves are stock items, and they can be fabricated in the field

The long range economy of Saran lined pipe starts right here—with the immediate availability of pipe, fittings and valves . . . as stock items. There's no waiting . . . no price premium to pay.

And Saran lined pipe can be fabricated in the field. Only conventional hand tools or power equipment are needed to cut and thread it right on the job site.

Saran lined pipe pays off through the years with superior corrosion resistance and strength. When you specify the new gray Saran lined pipe, valves, pumps and fittings, you'll be able to pipe commonly used acids, alkalies and other corrosive liquids under a wider temperature range.

You can plan a *complete* corrosion-free pipe system with Saran lined pipe, valves, pumps and fittings. They're available for systems operating from full vacuum up to 300 psi and temperatures from −20° F to 200° F. Send the coupon today for further information. And be sure to ask about Saraloy® 898 tank lining, too. THE DOW CHEMICAL COMPANY, Midland, Michigan.

SARAN LINED PIPE COMPANY
DEPT. 2002D-2
2415 BURDETTE AVENUE
FERNDALE 20, MICHIGAN

Please send me information on: ☐ Saran lined pipe, fittings and valves ☐ Saran lined centrifugal pumps ☐ Saraloy 898 chemical resistant sheeting

Name _____ Title _____ Company _____

Address _____ City _____ State _____

YOU CAN DEPEND ON DOW

Introducing Allied's

IRILAC™ #1000

New Clear Protective Coating for All Metals . . . as safe and easy to handle as Water!

New method of protection incorporates corrosion inhibitors in a water-soluble polymer base. Dries to an extremely thin, tough, durable coating—clear in color. Does not chemically affect base metal or any post-treatments. Used as a protective treatment alone or to enhance value of post-treatments.

Allied's new Irilac #1000 is a concentrated solution of a water-soluble polymer with built-in complex corrosion inhibiting materials. It was developed to answer the needs of the metalworking industry for a non-conversion process that will provide corrosion resistance and resistance to fingerprinting and abrasion on base metals and electrochemically or chemically finished surfaces—without changing the appearance of the metallic surface.

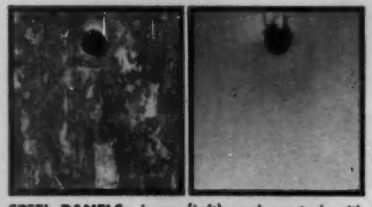
There are no hazards involved—Irilac is non-fuming, non-toxic, and requires no special fire prevention measures.

THE PROCESS

Irilac #1000 is diluted with water to provide a simple one-pass working solution. It is then applied by dip, brush or spray and forms a coating that quickly *bonds* to the metal surface without reacting with the surface.

THE PROPERTIES

The resulting coating is clear, transparent, thin yet durable. It has excellent water-resistant properties, and can be rubbed, handled and subjected to rough treatment. The surface to which Irilac has been applied is not altered—in fact, the transparent coating brings full tone to colored surfaces and clarity to iridescent surfaces. The water-thin physical characteristic of the solution means that the coating provides protection in recessed areas that are difficult, if not impossible, to protect with other methods.



STEEL PANELS: bare (left) and coated with Irilac (right) after 8-hour salt spray.

ALUMINUM PANELS: bare (left) and coated with Irilac (right) after 168-hour salt spray.

WHERE IRILAC CAN BE USED

Irilac #1000 can be applied to *any* metal—wet or dry—treated or untreated. All metals can be processed in *one* operation in the same solution. It can be applied in conjunction with any process—over Iridite, anodized, phosphated surfaces, black oxide, etc. Surfaces treated with Irilac provide a good base for paint.

APPLICATION ADVANTAGES

No other process or material available for the protection of metals offers all the application advantages found in new Irilac #1000:

1. It can be applied to any clean metal simply by dip, brush or spray. No special equipment is required.
2. Saves time—just apply and dry—no reaction time required.
3. No hazards involved—no exhaust or special fire protection equipment is required. Irilac is non-fuming and non-toxic.
4. Saves space. Presents no disposal problem. Low in first and final costs.

Because of its versatility and complete safety, Irilac has unlimited uses. For example, it will protect aluminum furniture, brass hardware and fixtures, steel parts of all types, zinc castings, etc. In fact, any base metal or plated surface, or those treated with electrolytic or chemical post-treatments, can be improved or enhanced with Irilac.

IRILAC #1000 MAY BE THE ANSWER TO YOUR PROTECTION PROBLEM

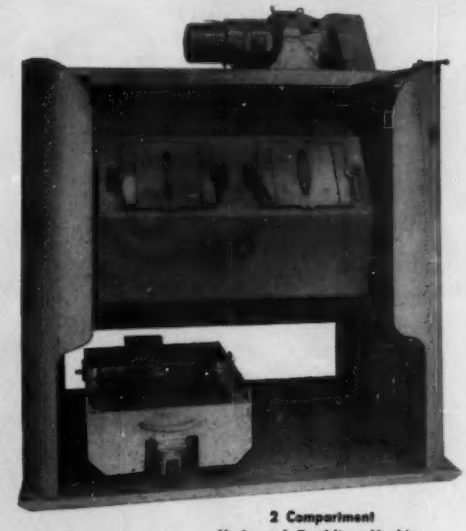
Our development staff will be glad to work with you to determine the significant benefits Irilac can offer you. Simply send us some parts and let us show you what Irilac can do. No obligation, of course.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET
BALTIMORE 5, MARYLAND

***Manufacturers of* IRIDITE®, IRILAC™, ARP® Brighteners and Plating Chemicals**
West Coast Licensee: L. H. Butcher Co.

CROWN TUMBLE
DEBURRING EQUIPMENT



2 Compartment
Horizontal Tumbling Machine

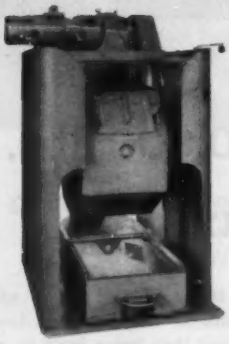
To deburr and tumble finish metal parts

Crown's complete line of newly improved tumbling machines and labor saving accessories provide huge savings in time-costs and labor.

- Light weight — quick acting "seal tite" doors with easily replaceable gasket.
- Front safety guard.
- Forward and reverse switch to rock barrel in rinsing and to position doors for loading and unloading.
- Easily accessible motor and bearings.
- Rubber lined — Neoprene lined — unlined.
- Special machines designed and built.

Mechanical Separating Table
Hoist Pan Type

Separating Table
Hand Type



Single Compartment
Horizontal Tumbling Machine

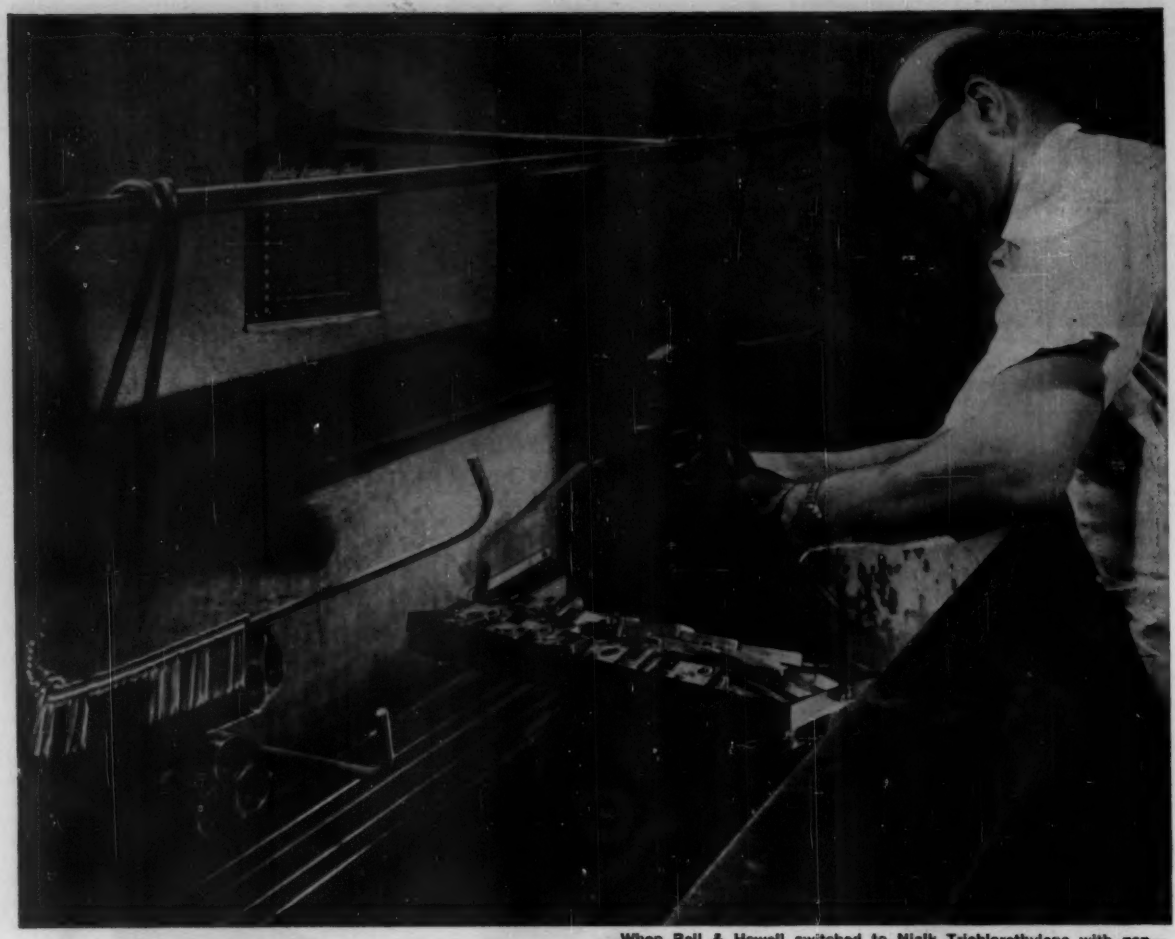
Separator — Motor Drive
with Hopper

Chip or Tumbling
Abrasive Bin

WRITE FOR OUR COMPLETE CATALOG OF TUMBLING MACHINES AND ACCESSORY EQUIPMENT

CROWN RHEOSTAT AND SUPPLY COMPANY

1965 PRATT BOULEVARD • ELK GROVE VILLAGE, ILLINOIS



When Bell & Howell switched to Nialk Trichlorethylene with psp—permanent staying power, it extended clean-outs to a full three months.

How Bell & Howell degreases 390,000 lbs. of metal parts between bath clean-outs

When Bell & Howell switched to a Nialk® Trichlorethylene bath recently, it was found that bath clean-outs could be extended to a full three months.

Previously the bath had to be cleaned *every ten days.*

With the new Nialk bath, Bell & Howell is degreasing 195 tons of small camera and projector parts between clean-outs. The parts are aluminum, brass, steel and zinc and can all be cleaned in the same bath.

The secret is in the stabilizer The only thing different about the Bell & Howell bath is the Nialk stabilizer. Light, heat, air and acids have no effect on the bath. Even aluminum fines, which can sour trichlor fast, have no effect in the presence of the Nialk stabilizer.

This stabilizer is not extracted by water either; hence all of it is reclaimed during distillation and steam injection. So permanent is the stabilizer that the bath stays fresh and fully protected at all times.

Bell & Howell simply adds more trichlor as drag-out losses lower the bath level; they never have to replenish the stabilizer itself.

FREE BULLETIN • The whole question of stabilizers is so important to anyone concerned with vapor degreasing, we've written a bulletin specifically on the Nialk stabilizer and its advantages. Write for Bulletin 70 if you'd like a copy.

HOOKER CHEMICAL CORPORATION
1311 Union Street, Niagara Falls, N. Y.

HOOKER CHEMICALS PLASTICS

NIALK® CHEMICALS
OLDBURY® CHEMICALS
SHEA® CHEMICALS
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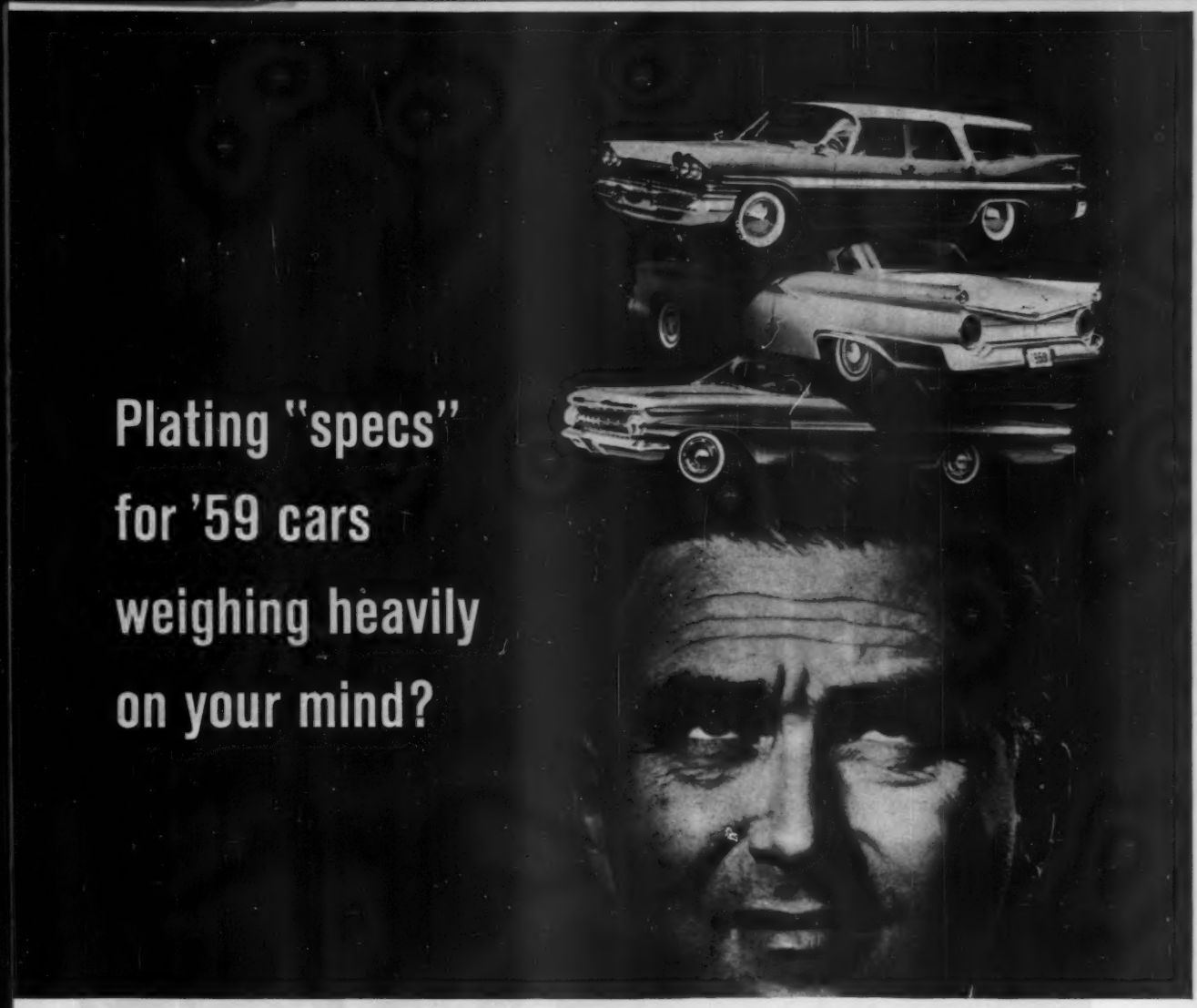
Sales Offices: Chicago, Ill.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C



Get more coverage, throwing power, corrosion resistance,
with Unichrome BRIGHT CRACK-FREE CHROMIUM

Unichrome Bright Crack-Free Chromium not only helps you avoid rejects in plating new and unfamiliar parts, but also multiplies corrosion resistance.

With better covering and throwing power, this process gives more uniform plate distribution . . . makes it far easier to get proper plate thickness both on high current density areas and in low current density recesses.

Even more important, you achieve better corrosion protection because of freedom from the microscopic corrosion-admitting cracks which impair ordinary chromium deposits.

Unichrome Crack-Free Chromium baths are self-regulating. You don't need constant chemical analyses to keep these "automated" solutions in proper balance for perfect plating.

Save time, save rejects . . . talk over your chromium plating "headaches" with an M&T engineer.

METAL & THERMIT Corporation
GENERAL OFFICES: RAHWAY, NEW JERSEY
Pittsburgh • Atlanta • Detroit • East Chicago • Los Angeles
In Canada: Metal & Thermit—United Chromium of Canada, Ltd., Rexdale, Ont.

for the "Solution to your Plating Problems" .... come to

JELCO

BRASS ADDITIVE

... can be used in standard & high speed formulations — still & barrel plating

One of America's leading manufacturers
- BRASS Additive
- COP-BRITE
- BARREL COPPER Brightener
- BARREL NICKEL Brightener

- Increases efficiency and throwing power
- Produces brighter and faster plating
- Allows use of higher current density
- Retards anode polarization
- Eliminates cyanide and ammonia fumes

A Proven Process!

Used successfully by job platers and manufacturers

NON-CRITICAL
BOOSTS PRODUCTION
CUTS REJECTS

For technical information, complete details and prices ... write to

JELCO Finishing Equipment Corp.
153 East 26th Street, New York 10 · Phone LExington 2-3055

Rhodium
ELECTROPLATING SOLUTIONS

Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.

Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.

Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.

Since 1901

Consult our staff, without obligation, about your plating problems.

SIGMUND COHN MFG. CO., INC
Specialists in the Unusual
121 SOUTH COLUMBUS AVE., MOUNT VERNON, N. Y.

Stainless Steel Hinge... satin finished with 220 grit Lea Compound.

Small Brass Hinges... bright buffed and then satin finished with Lea Compound. A beautiful lustre-satin finish.

LEA SATIN FINISH

Brass Plated Long Hinge... base is steel, satin finished with Lea Compound. Hinge is then brass plated and satin finished again with same compound. Real eye-appeal.

for a Better Finish... an Eye-Appeal Finish... a Lower Cost Finish at

THE HOMER D. BRONSON CO.

CONTINUOUS HINGES AND BUTTS

This is top quality hardware... hardware that demands a good looking finish which will take a real beating. For this type of finish, The Homer D. Bronson Co. specifies a LEA SATIN FINISH. A Satin Finish is a Modern Finish, a finish with real sales appeal... and it's a low cost finish!

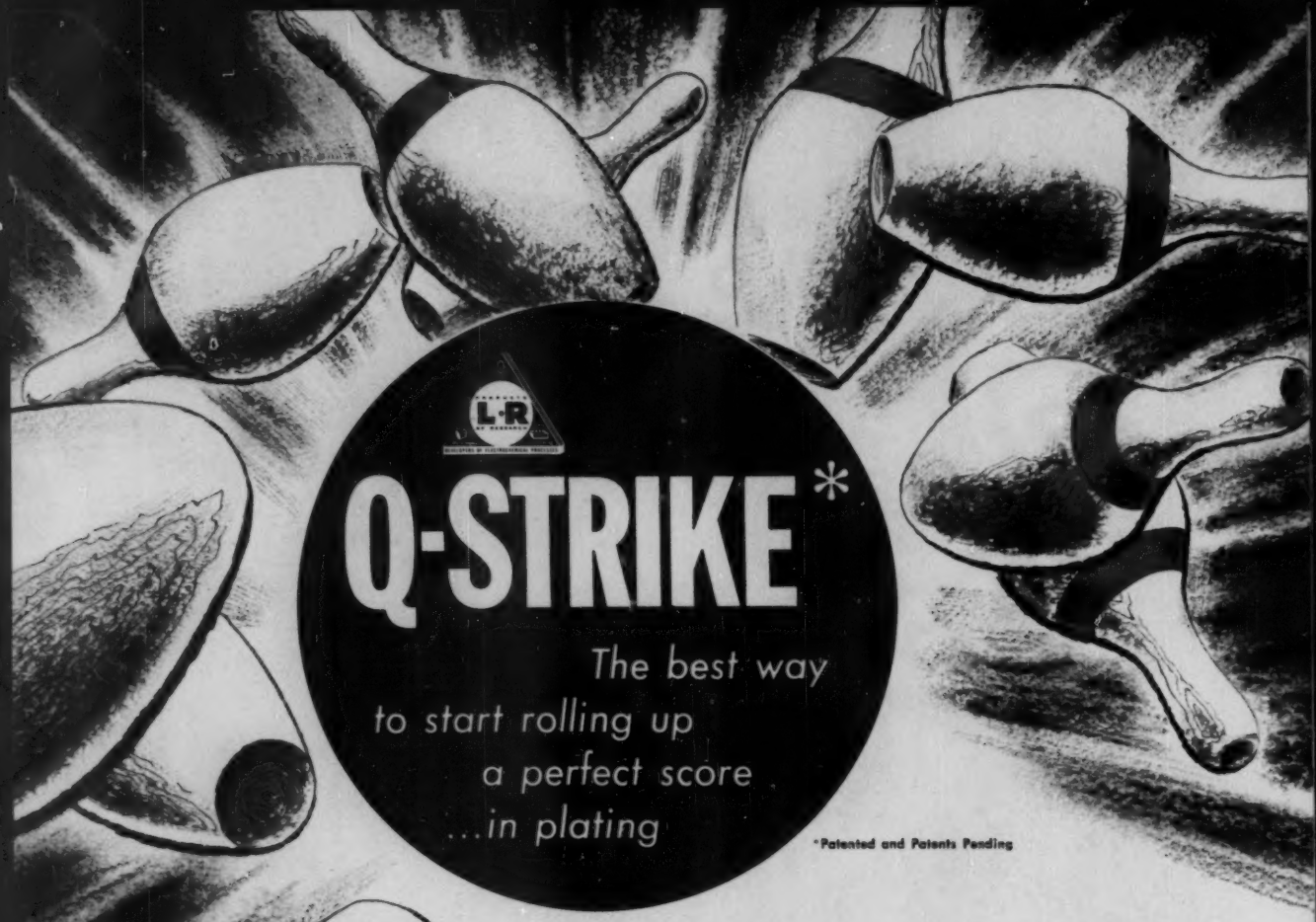
Why not try a Lea Satin Finish on your products... elegance with a modern flair. Write today for details.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing... Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok... Industry's quality buffing and polishing compounds for over 30 years.

The Hallmark of Quality Products

THE LEA MANUFACTURING CO.
16 CHERRY AVENUE · WATERBURY 20, CONN.

Are you interested in Plating Specialties? SEE THE OTHER SIDE OF THIS INSERT.



Q-STRIKE*

The best way to start rolling up a perfect score ...in plating

*Patented and Patents Pending

Q-STRIKE gets its name from Cu, the chemical symbol for copper and from 'strike', that vitally important *first* deposit of copper.

Q-STRIKE is an addition agent for cyanide copper strike solutions, offering the following advantages:

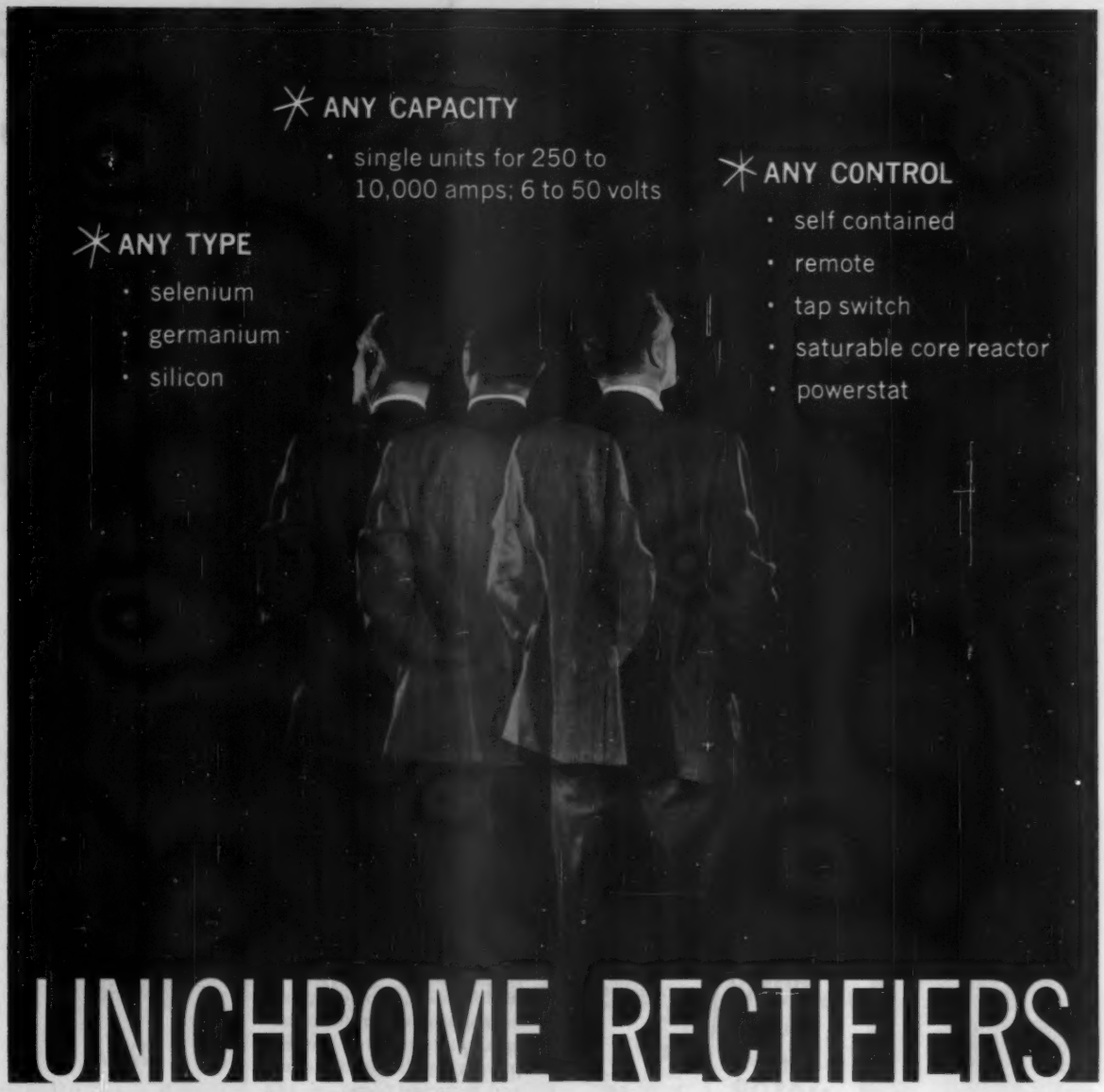
- produces a superior foundation deposit needed for high quality plating
- unlike the conventional copper strike that tends to reproduce the surface of the base metal, Q-STRIKE produces a refined, oriented crystal deposit that hides surface imperfections.
- the subsequent Bright Copper deposit over Q-STRIKE shows real hiding power, greater brightness and leveling.
- similar benefits where nickel is deposited immediately after the copper strike.
- reduces materially the troubles associated with copper strikes as well as increases tolerance to metallic contaminants and carbonates.

Q-STRIKE is another of the big developments by the Lea-Ronal Research Laboratory. It presents a definite improvement over other copper strikes. It provides an excellent foundation for further deposits...as a good test in your plant will show. It is simple to use. Order a test quantity now and be ready for the expanding business that's coming.

Lea-Ronal Inc.

Sales and Manufacturing Plant: 237 East Aurora Street, Waterbury 20, Conn.
Main office and Laboratory: 139-20 109th Avenue, Jamaica 35, N. Y.

Are you interested in Buffing, Polishing & Burring Specialties? SEE THE OTHER SIDE OF THIS INSERT



UNICHROME RECTIFIERS

...give you full choice to choose the best for your plating needs

Good design distinguishes Unichrome Rectifiers. They have been built to meet the specifications of M&T engineers, who know plating plant operations intimately through long service and experience.

And since Unichrome Rectifiers are available in all types, styles and sizes, a plater can be confident that recommendations are unbiased and based solely upon a desire to deliver optimum economy in plating. Call us in for a survey of your needs and our recommendation.

METAL & THERMIT Corporation
GENERAL OFFICES: RAHWAY, NEW JERSEY
Pittsburgh • Atlanta • Detroit • East Chicago • Los Angeles
In Canada: Metal & Thermit—United Chromium of Canada, Ltd., Rexdale, Ont.

NEW!

Sethco all-in-one FILTER PUMP UNIT

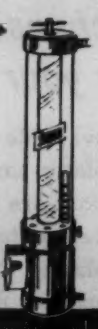
150 GALS. PER HR.

LEAKPROOF SPACE-SAVING and PORTABLE

- **FULL VIEW CHAMBER:** High temperature Epoxy-Lucite to 140° F. or Epoxy-Pyrex to 250° F.
- **FILTER TUBES:** Cotton, Dynel, Porous Stone or Porous Carbon.
- **CANNED PUMP:** Corrosion resistant stainless steel, centrifugal, self-lubricating and leakproof. No seals, no stuffing box needed.
- **MOTOR:** ⅛ HP, 110v, 60cy, 1 ph, Totally enclosed. With thermal starting and overload relay.
- **HANDLE:** for easy portability where it's needed.
- **BASE:** Corrosion resistant high temperature Epoxy.

the PUMP is housed in the MOTOR

◀ Model LEI-10
Model LEI-20 ▶



OTHER 'canned' pump models with ¾ HP motors available for filtering up to 1800 gals. per hour.

Effective **DEPTH FILTRATION** down to 1 micron. No contamination, no leakage of hazardous, sensitive or expensive solutions. Gold, Silver, Palladium are easily reclaimed by igniting cotton filter tubes.

WRITE for Illustrated Folder

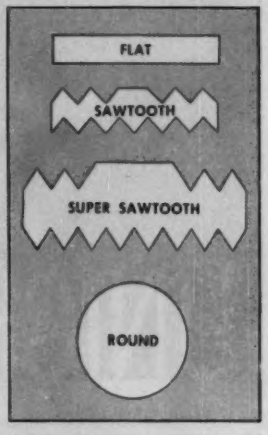
Sethco Mfg. Co.

2286 Babylon Tpke., Merrick, L. I., N. Y.

Cut PLATING *Costs* with HEIL LEAD ANODES

. . . they last longer

Standardize on Heil Lead Anodes for maximum economy, performance and dependability. Fabricated of all new virgin lead, Heil Anodes are dense and free from voids,—reducing "pitting" and assuring long lasting service. Hooks are bonded homogeneously to the bulb by Heil expert lead-burners, providing unobstructed current flow and maximum throwing power, increasing plating efficiency and reducing costs.



Furnished in flat, round, sawtooth, and herringbone designs. Any size — any length, for any requirement.

Ask us also about Conforming Anodes; and Tanks, Fume Collecting Hoods, Fans, Ducts, Stacks and other facilities.

Write **for the Heil fully descriptive bulletins. They give sizes and complete details.**

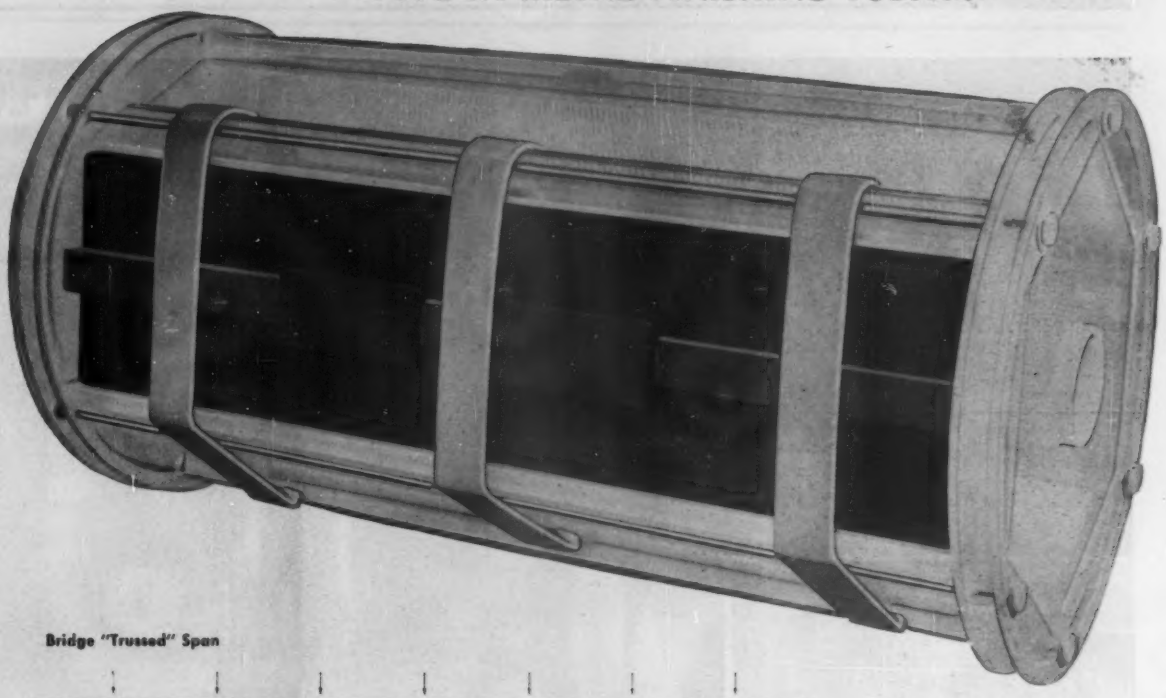
CHEMICAL-PROOF LININGS · TANKS HEATERS PLASTICS

HEIL PROCESS EQUIPMENT CORPORATION

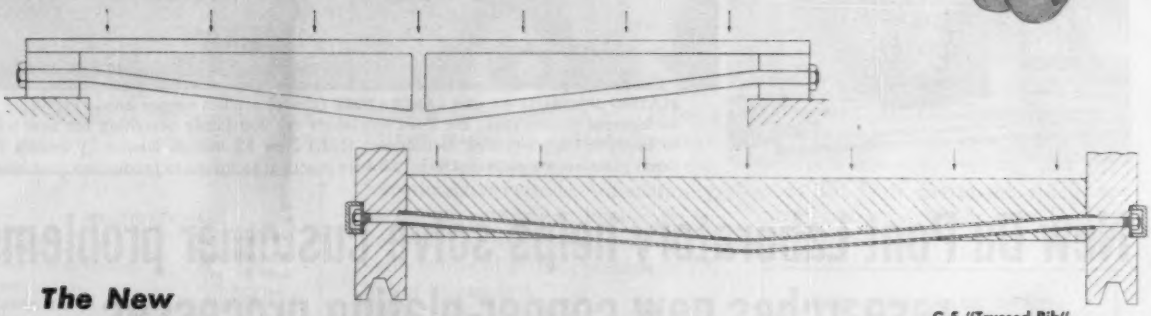
12901 Elmwood Ave. • Cleveland 11, Ohio

BUILT LIKE A BRIDGE

TO OUT-PERFORM ANY OTHER CYLINDER OF ITS TYPE IN METAL FINISHING TODAY!



Bridge "Trussed" Span



G-S "Trussed-Rib"

The New G-S "Trussed-Rib" All-Bolted Plating Cylinder

Temperatures to 220°F. Loads to 275 lbs. Bussed for 1420 amps. 100% Thru-Cycle. All Replaceable Parts. Fits Your Equipment.

Outlasts them all up to 3 to 1. Operates in solutions other makes can't tolerate. Ribs "trussed" by Stainless Rods (G-S XL-12 coated) for extra belly-strength; no bulging. H-T Plexiglas Bolt Caps (G-S XL-8 coated) permanent protection. **All-bolted,** tongue and groove construction. Parts standard, interchangeable in H-T Plexiglas, G-S Polydur, Tempron; any combination. Replace any part in 20 min. Use only a ½" wrench. Ends down-time and high-costs of "outside" rebuilding. Service life practically unlimited. Cylinders to fit all makes superstructures. Belt-driven cylinders with superstructures to fit all makes tanks and drives. Tanks with motor and bussing to match your present equipment of other makes.

Send for complete equipment literature, prices.

The G. S. Equipment Co.

15583 Brookpark Rd., Cleveland 35, Ohio, CLearwater 2-4770

How do **your** cylinders rate in this "value chart"? Here's how the "big 4" nationally-known makes of composition cylinders compare. Pick the winner: **G-S!**

Replacement Cylinders	Temperatures To 220°F.	Loads To 275 lbs.	Bussed for 1420 amps.	100% Thru-Cycle	All-Welded or All-Bolted	Fit All Makes, Sizes
G-S	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
"A"	NO	NO	NO	NO	**YES**	NO
"B"	**YES**	NO	NO	**YES**	NO	NO
"C"	NO	NO	NO	NO	NO	NO

The above is based on actual service tests, plus technical data made public by the manufacturers of all cylinders represented in the chart. Brand names of cylinders A, B, and C available on request.

DU PONT
REG. U. S. PAT. OFF.

PRODUCT NEWS

PLATING SPECIALIST AT NEW LABORATORY (above) studies copper anode corrosion in transparent plating tank. Du Pont specialists are constantly searching for new ways to improve copper-plating techniques. (Left) New $2 million laboratory houses the latest plant-scale equipment to help insure practical solutions to production problems.

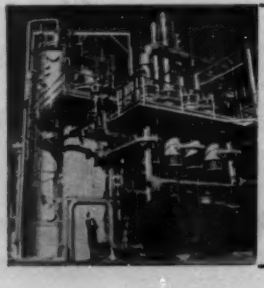
New Du Pont Laboratory helps solve customer problems ...researches new copper-plating processes

Plating problems are a major consideration at Du Pont's new Sales Technical Laboratory. Here, trained specialists use full-scale plating equipment to work out practical answers that can help you improve copper-plating quality, speed production, cut costs.

Research in plating techniques and processes is another important activity at the new lab. This continuing Du Pont research has resulted in a new high-speed cyanide process for bright-copper plating on steel parts and zinc die castings. This new process has been thoroughly field-tested, and is producing high-quality results on such parts as automobile bumpers and grilles, hardware products and wire.

Another Du Pont development now undergoing tests and refinements is a new technique for plating level copper on polished-steel parts. This new process promises to eliminate unracking, buffing and cleaning prior to nickel and chromium plating on many different types of parts. The level-copper process holds considerable promise for the plating of zinc-base die castings for smoother, more uniform deposits with excellent hiding power.

Ask your Du Pont Technical Representative for more details about these new plating developments resulting from Du Pont research, or about any of the products on the opposite page.



MODERN PLANT ASSURES DEPENDABLE SUPPLY OF QUALITY PLATING CHEMICALS

Du Pont plant at Memphis, Tenn., is now producing highest-purity sodium cyanide and potassium cyanide to meet your plating requirements. Example: Du Pont potassium cyanide is 98% minimum pure with .0003% maximum sulfides (as sulfur). You can order mixed shipments . . . save time, money, storage space.

FOR BETTER COPPER PLATING

Du Pont research results in Copper-Plating Chemicals that help you speed production, improve quality

Pre-mixed for your convenience —unique Du Pont double salt

This new salt developed by Du Pont combines high-purity Du Pont Cyanobrik® sodium cyanide and copper cyanide into *one* convenient copper-plating chemical for both bath make-up and replenishment. It saves time, cuts down handling of chemicals for greater safety, reduces errors because ingredients are already in the proper proportions required by bath.

SPECIFICATIONS

Copper	28.7% min.
"Free" sodium cyanide	0.4% to 2.0%
Lead	7 ppm. max.
Sulfides as sulfur	10 ppm. max.
Insolubles	0.01% max.

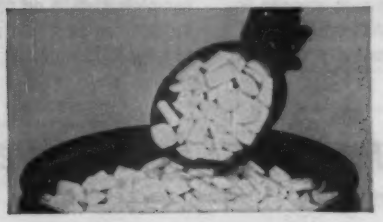
TYPICAL ANALYSIS

Copper	29%
"Free" sodium cyanide	1%
Lead	Less than 1 ppm.
Sulfides as sulfur	Less than 5 ppm.
Insolubles	0.01%

Du Pont Copper Cyanide— regular plating tests insure quality

With Du Pont Copper Cyanide your benefit is in low unit costs that result from savings in time, labor and overhead charges. For example, Du Pont Copper Cyanide readily dissolves in cyanide solutions without introducing inert salts into the plating bath. In addition, you get faster plating with high current density and rapid metal deposition.

Du Pont guarantees a copper content of 70.0% min. and a cyanogen content of 28.5% min. As a further guarantee of the quality of Du Pont Copper Cyanide, regular plating tests are conducted by Du Pont to insure maximum performance.



Du Pont Cyanobrik® now guaranteed 97% min. sodium cyanide

New high-purity "Cyanobrik" sodium cyanide specifications guarantee a higher minimum cyanide content, which can result in a lower net cost for your active cyanide. Automatically, maximum permissible impurities are lowered. This means that you get a full extra pound of active cyanide per 100 lbs. of "Cyanobrik."

You can count on the uniform high quality of "Cyanobrik" for even the most critical plating jobs. The negligible sulfide content makes Du Pont "Cyanobrik" particularly suitable for use in sulfide-sensitive electrolytes, such as proprietary bright-copper baths.

SPECIFICATIONS

Sodium cyanide	97% min.
Sodium chloride	0.2% max.
Sulfides (as sulfur)	0.0005% max.

TYPICAL ANALYSIS

Sodium cyanide	97.5%
Sodium hydroxide	0.4%
Sodium carbonate	1.5%
Sodium formate	0.35%
Sodium chloride	0.1%
Water	0.15%
Sulfides (as sulfur)	0.0004% (4 ppm.)

Drum head comes off quickly with a few turns of a wrench.

Easy-opening, reclosable drums simplify handling of "Cyanobrik" sodium cyanide

Both 100- and 200-lb. net steel drums for "Cyanobrik" sodium cyanide are nonreturnable open-head steel drums. A few turns of a wrench open the drum. It closes just as easily, giving full protection to partially used contents during storage.

FOR MORE INFORMATION about any or all of Du Pont's full line of high-quality products for copper plating, just give your Du Pont distributor a call, or write your nearest Du Pont District Office listed below.

DISTRICT AND SALES OFFICES:

Baltimore 2 . . . . . 321 Fallsway
Boston 10 . . . . . 140 Federal St.
Charlotte 1 . . . . . 427 W. Fourth St.
Chicago 46 . . . . 7250 N. Cicero Ave., Lincolnwood
Cincinnati 2 . . . . . 2412 Carew Tower
Cleveland 20 . . . . 11900 Shaker Blvd.
Detroit 35, 13000 W. Seven Mile Rd.
Kansas City 20* Guinotte & Mich. Av.
Los Angeles Box 70, El Monte, Calif.
New York 1 . . . . . 350 Fifth Ave.
Philadelphia . . 308 E. Lancaster Ave., Wynnewood
San Francisco 4 . . . . . 111 Sutter St.

Export Division, Du Pont Building Wilmington 98, Del.
*Barada & Page, Inc.

ELECTROCHEMICALS DEPARTMENT
SODIUM PRODUCTS DIVISION
E. I. DU PONT DE NEMOURS & CO. (INC.)
WILMINGTON 98, DELAWARE

DU PONT
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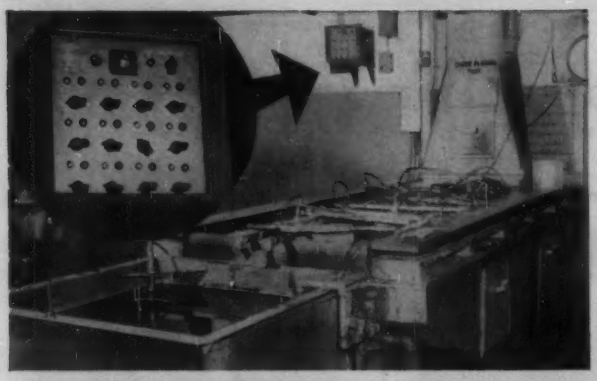
Better Things for Better Living...*through Chemistry*



AT CURTISS-WRIGHT A

96% WATER SAVINGS...

OVER A SIX MONTH PERIOD

THROUGH THE USE OF INDUSTRIAL INSTRUMENTS'

AUTOMATIC RINSE TANK CONTROLLER

Proof-positive! Actual production tests under normal operating conditions over a six month period using a Solu Bridge Control Unit produced a 96% savings in water usage in the plating department of Curtiss-Wright.

Another outstanding case history of tremendous savings in water and dollars when Solu Bridge Control Units are installed. Solu Bridge Control Units consist of conductivity cell and solenoid valve for each rinse tank with either individual or central control and measuring unit. Fresh water is added automatically whenever conductivity of water exceeds preset level.

Contact your local supplier today, or write directly to us for complete details on how this low-cost, economical to operate system can save you many hundreds of dollars in water and sewage bills annually.

Industrial Instruments INC.

89 Commerce Road, Cedar Grove, Essex County, N. J.

COMING EVENTS

AMERICAN ELECTROPLATERS' SOCIETY

DETROIT BRANCH
DECEMBER 5-6
Annual Educational Session and Banquet, Hotel Statler Hilton, Detroit, Mich. Banquet limited to 860 tickets. Nonmembers of the Detroit Branch can obtain them, if available, from T. K. Friedt, United Platers, Inc., 3456 Denton, Detroit 11, Mich. at $10.00 per person.

NEWARK BRANCH
DECEMBER 12-13
Annual Educational Session and Christmas Party, Hotel Robert Treat, Newark, N. J.

BUFFALO BRANCH
DECEMBER 20
Annual Christmas Party, Niagara Manor, Buffalo, N. Y.

GRAND RAPIDS BRANCH
JANUARY 17, 1959
Annual Educational Session and Banquet, Pantlind Hotel, Grand Rapids, Mich.

CHICAGO BRANCH
JANUARY 31, 1959
Annual Meeting and Banquet, Conrad Hilton Hotel, Chicago, Ill.

CLEVELAND BRANCH
JANUARY 31, 1959
Annual Educational Session and Dinner-Dance, Cleveland, Ohio.

NEW YORK BRANCH
FEBRUARY 7, 1959
Annual Educational Session and Banquet, Hotel Statler Hilton, New York, N. Y.

DIXIE REGIONAL GROUP
FEBRUARY 13-14, 1959
Educational Session and Banquet, Southeastern Host Branch, Dinkler Plaza Hotel, Atlanta, Ga.

FIFTH INDUSTRIAL FINISHING EXPOSITION
JUNE 15-19, 1959
Golden Jubilee Convention and International Exposition, Including Fifth International Conference on Electrodeposition and Metal Finishing; Convention Headquarters — Hotels Statler Hilton and Sheraton-Cadillac; Exposition — Artillery Armory, Detroit, Mich.

ONE

gets you TEN . . .

A.P.A. Dial-Cycle Selector

in this new

ABBEY-MATIC MULTI-CYCLE RACK SYSTEM

Here, one man operates a king-size fleet of rack-carriers through ten different, fully automated processing cycles — by just a "twist of the wrist." The only manual operation is the simple setting of each rack-carrier's Dial-Cycle Selector at the number corresponding to the process cycle scheduled. Each rack-carrier then proceeds meticulously "thru-cycle" (full-processing) to completion — all automatic. No confusion, delays, errors. Flow is continuous, uninterrupted. All rack carriers function robot-fashion, independently, "load-thru-unload" — without manual "assists" of any kind.

10 Process Cycle Options per Carrier individually selected by the turn of a dial as follows:

1. **Copper Plating;** Sta: 1, 2, 3, 4, 5, 6, 7, 8, 9, 28, 29, 30.
2. **Nickel Plating;** Sta: 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 22, 28, 29, 30.
3. **Nickel-Chrome;** Sta: 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 22, 23, 24, 25, 27, 28, 29, 30.
4. **Nickel-Brass;** Sta: 1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15, 16, 17, 24, 25, 27, 28, 29, 30.
5. **Tin;** Sta: 1, 2, 3, 4, 5, 6, 7, 17, 18, 19, 27, 28, 29, 30.
6. **Bright Dip;** Sta: 1, 2, 3, 4, 5, 6, 20, 21, 27, 28, 29, 30.
7. **Electro Polish;** Sta: 1, 2, 3, 4, 5, 6, 26, 27, 28, 29, 30.
8. **Copper-Nickel;** Sta: 1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 22, 28, 29, 30.
9. **Copper-Nickel-Chrome;** Sta: 1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 22, 23, 24, 25, 28, 29, 30.
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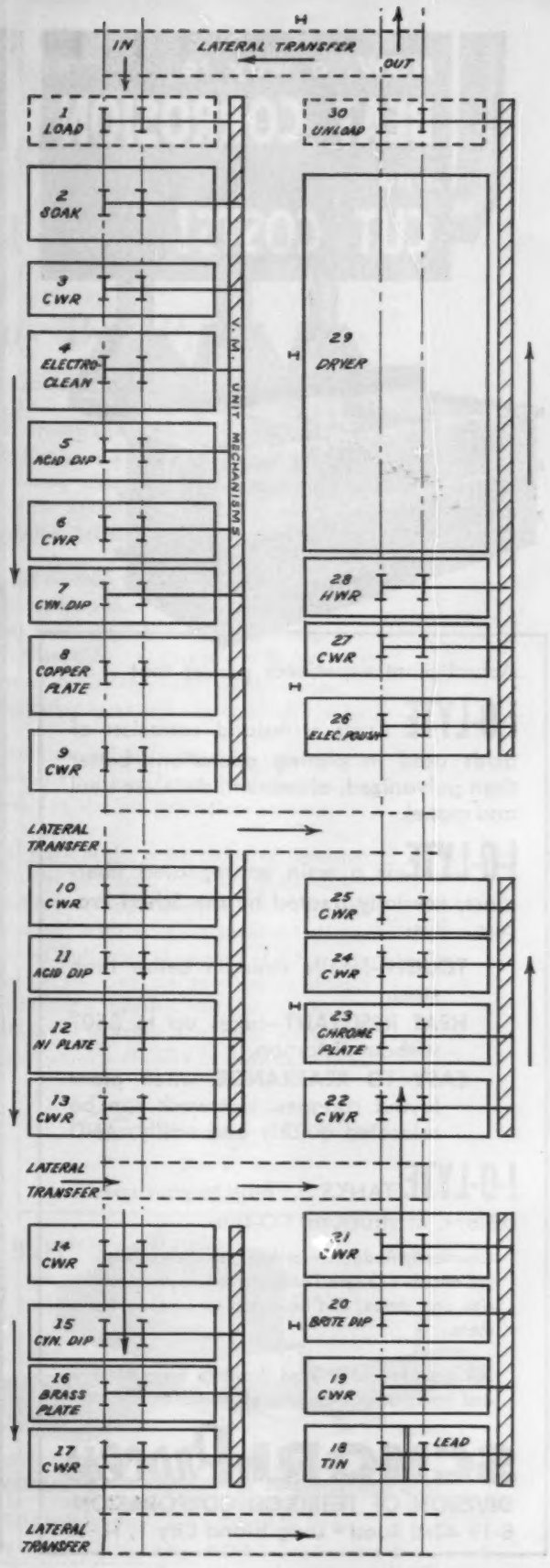

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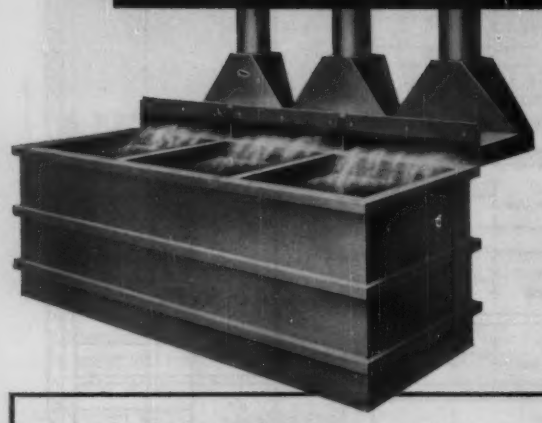

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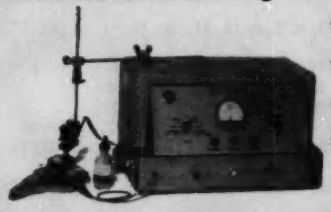

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by Ben P. Sax

Chairman of the Board, *American Buff Company*

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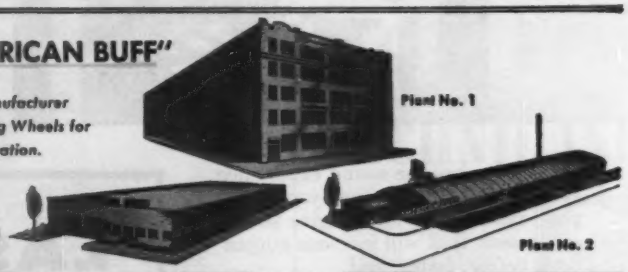

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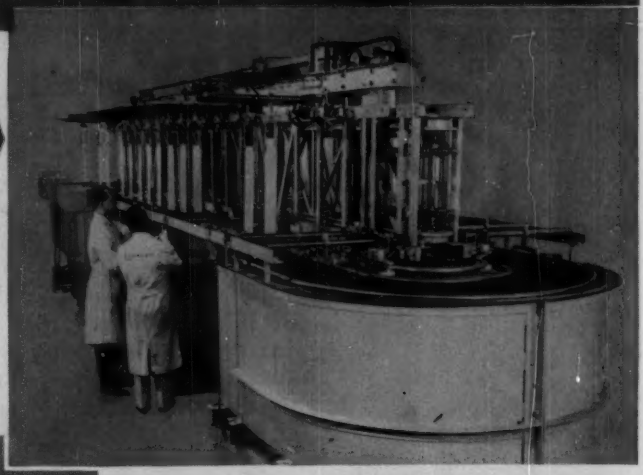

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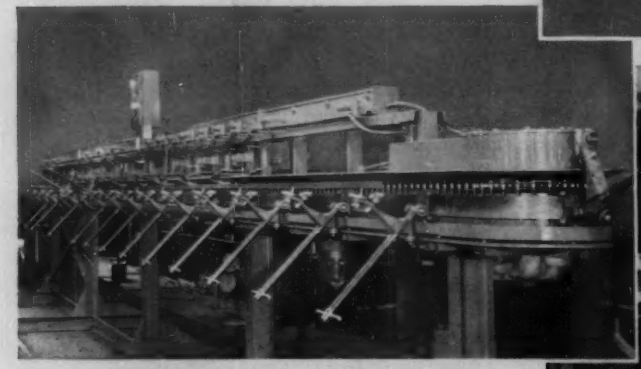

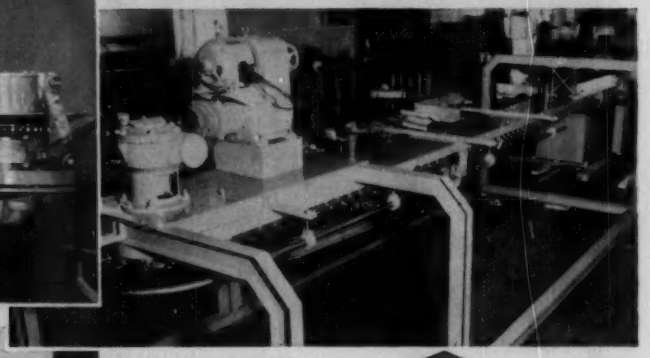

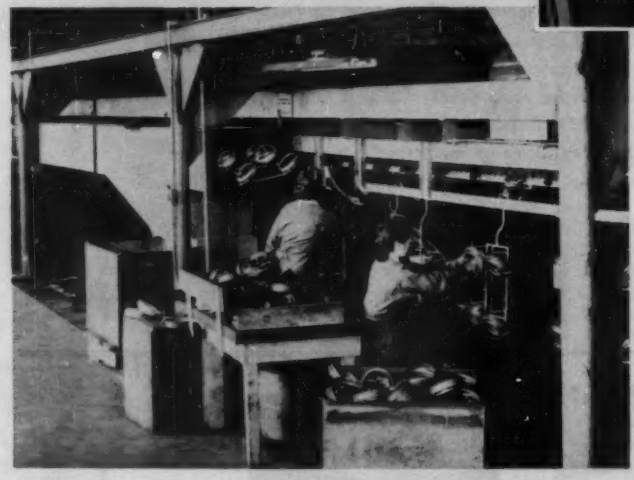

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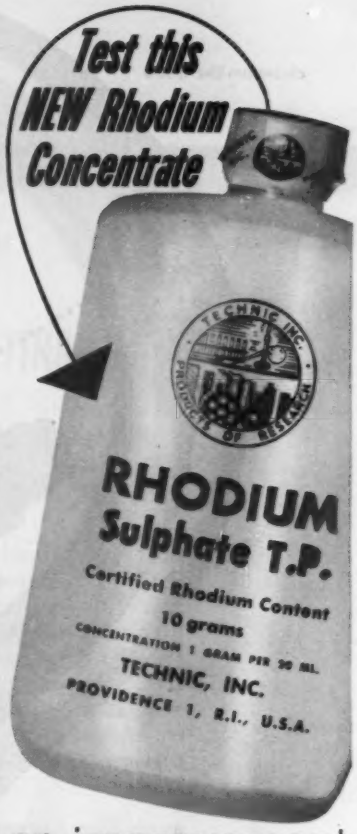

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ESTABLISHED 1903 VOLUME 56 • NUMBER 11 • NOVEMBER, 1958

ACCELERATED CORROSION TESTING

In the forty-odd years of its existence, the salt spray test has probably been subject to almost as many pages of criticism as of experimental data, not only because of its inability to correlate with atmospheric performance, but because of its inability even to correlate with itself.

The 20% salt solution was universally specified until recently, despite its well-known tendency to cause clogging of the spray nozzles, because it had been confirmed, time and time again, that the 5% solution had practically no value in assessing copper-nickel-chromium deposits. When the latter was acidified with 1% acetic acid, however, the result was a test method which was quite effective and was not troubled to any extent with dry spray and clogged nozzles. This modification has been receiving broad recognition in this country as a most generally useful test, even though it is not entirely satisfactory for deposits on copper-base alloys, where skilled interpretation is required. It may be expected to supersede the older test completely in the foreseeable future.

In Europe, on the other hand, investigation has been concerned with accelerated corrosion tests employing sulfur dioxide, which is considered one of the more important corrosive agents found in industrial atmospheres. Although at least three procedures have been reported, the one which has aroused greatest interest is the BNF test, which is conducted at room temperature in an atmosphere containing 1% by volume sulfur dioxide, at a relative humidity above 95%. Test conditions can be maintained easily, reproducibility is good, even between test cabinets of different size and construction, and the corrosion pattern is quite similar to that produced by an industrial environment. Of greater significance, probably, is its rapidity, test results for quality control being available in 24 hours.

All tests have limitations, and it is of the utmost importance that these be recognized, lest we end up with the indiscriminate dependence which has characterized salt spray specification as an acceptance or performance test. The field of application of sulfur dioxide appears to be limited to quality control of nickel-chromium or copper-nickel-chromium deposits on steel or of nickel deposits over 1 mil in thickness, where it is the most rapid test available. It is considered unsuitable for deposits on zinc or copper base alloys or for anodized aluminum. The "Corrodkote" test, in which a corrosive paste is applied, followed by storage at high humidity, may be more convenient in many cases, and should increase in popularity as it becomes more familiar to the metal finisher. The acidified, 5% salt spray solution, however, can be considered the most useful today, despite its slowness compared to the sulfur dioxide test, since it can be used for evaluation of coatings on zinc or brass, in addition to steel. With this test there is a definite relationship between thickness of oxide on anodized aluminum and rate of breakdown, an effect shown by none of the other tests. As to the straight salt spray test, the less said, the better!

Nathaniel Hall

Light-Fastness of Organic Dyes on Anodized Aluminum

By Dr. R. C. Spooner, *Aluminium Laboratories Ltd., Kingston, Ontario*

Introduction

ALTHOUGH the coloring of metal surfaces has a history reaching back into antiquity, none of the many processes developed for any metal can compare in range and depth of color with those produced by the dyeing of the anodically produced oxide film on aluminum and its alloys. The procedure is simple and not only colors the surface but provides a coating with high abrasion and increased corrosion resistance.

The basis for current commercial anodizing was established in 1923 by Bengough and Stuart[1] who employed a chromic acid solution. Shortly afterwards, Flick[2] described a method of coloring the anodic film by either adding a dye to the electrolyte or immersion of the coating in a warm dye solution after anodizing. The dyes employed were said to "lake", that is, to form an aluminum salt by reaction with the oxide or hydroxide. Sulphuric acid anodizing was developed a little later and displaced chromic acid anodizing for most applications including particularly those for which dyeing was intended.

For many years the coloring of anodized aluminum articles by dyeing with organic dyes was a novelty. The dyes employed were those readily available because of their use in dyeing various textiles. Some of these proved quite satisfactory, others failed to produce adequate color, while many gave a good initial color which, unfortunately, had poor light- or wash-fastness. Because of the limited demand, little interest was shown in the selection or development of dyes specifically for anodic coatings.

During and immediately after World War II the commercial use of dyed anodic coatings steadily increased, but lack of adequate information about the proper use and the light-fastness of many of the available dyes caused unsatisfactory results. The available light-fastness ratings were based on standards developed for the textile industry which were not adequate for use on anodic films, except for applications under mild interior conditions. In one case, a set of dyed anodized samples produced in India and forwarded to Canada for examination arrived with little or none of the original color apparent; the dyes had faded en route even though the specimens were in a closed container. In another case,[3] investigation of 250 dyes intended for anodizing panels revealed only 20 which passed a 400 hour Fade-Ometer test.

The program described in this paper was initiated some years ago to select from the dyes suggested by various dye manufacturers for use with anodic coatings and available in Canada, those with superior light fastness in commercial applications and particularly in outdoor exposures.

Light-Fastness Testing Survey

A total of 115 organic dyes produced by 11 manufacturers was tested. Special efforts were made to include all dyes recommended at that time for coloring anodic films and to employ them in accordance with the manufacturer's recommendations. Panels produced by the Aluminum Company of Canada, Ltd. of special anodizing quality aluminum sheet (Alcan 3S; U. S. Alloy 3003) clad with Alcan 1S (U. S. 1175)) were cleaned by soaking in a hot, inhibited alkaline cleaning solution, anodized in a 15% by weight sulphuric acid solution at either 15 or 18 amp./ft.^{2}, dyed in aqueous solutions of various dyes at 60 to 70°C. for 10 minutes, and finally sealed in water at a pH of about 6.0 and at 95 to 100°C. for 30 minutes. The panels were rinsed in cold water after the various treatments. There was some variation in the anodizing time (30 to 40 minutes except for black dyes which required 40 to 50 minutes) and temperature (21 to 29°C.) of the solution. In later work a uniform time (30 minutes; 40 minutes for black dyes) and temperature (21°C.) was adopted. Coating thickness was approximately 0.0005 in. (black dyes 0.0006 in.).

Sets of from 5 to 20 panels of 2½ x 4½ in. size were prepared for each dye for exposure to indoor, Fade-Ometer, and outdoor (Kingston) conditions. A few dyes of unsatisfactory promise were omitted from the latter two tests. The upper inch of each panel was masked with aluminum foil before initial exposure to preserve a band of the original color. As color changes appeared after appropriate periods, the foil mask was widened to protect an additional narrow band which was marked accordingly. This procedure was continued throughout the test, thus producing a series of bands illustrating the color after the various exposure periods.

The arbitrary color grading system employed to describe the degree of fading was simple and direct. Dyed panels after each period of exposure were examined and the color of the tested area compared with the initial color and graded as follows:

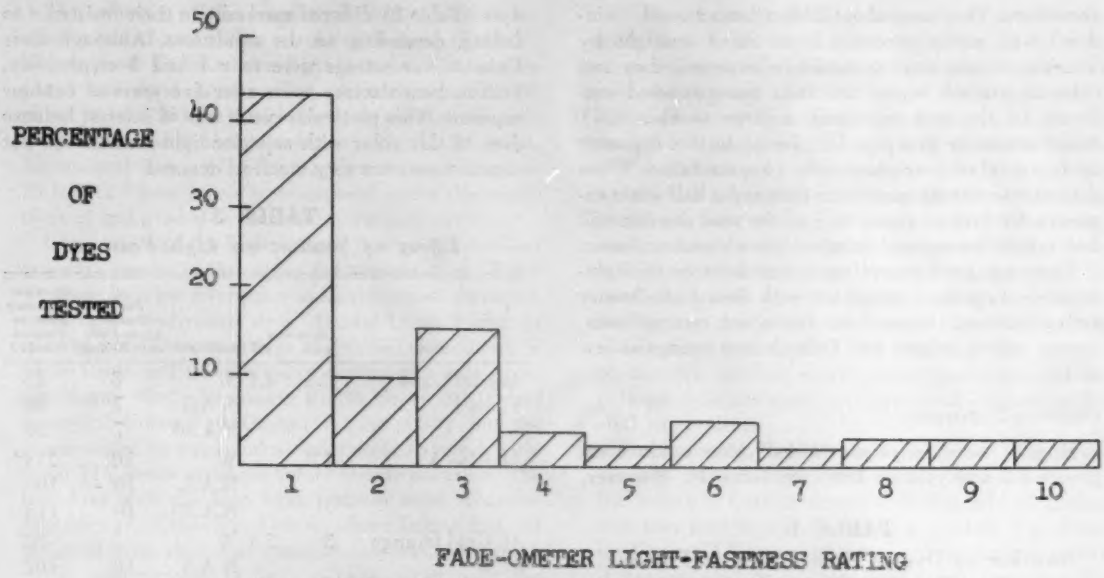


Fig. 1. Fade-Ometer Light-Fastness Rating of Organic Dyes on Anodic Coating.

Grade	*Degree of Fading*
5	No change or very slight change
4	Slight fading
3	Fading
2	Severe fading
1	Almost complete loss of color

The term "fading" included changes in shade or slight alterations in the color. A change from "3" to "2", it was considered, would cause strong objection by a user and was therefore taken to constitute "Failure."

This method of evaluating the color change on exposure has several limitations. All methods of visual evaluation of color, and even many "instrument" appraisals, are influenced by personal bias. In the procedure used, determination of the point of "failure", that is, the change from a "3" to a "2" grading, is critically important. Independent gradings by several observers checked each other very well in estimation of this point and thus personal error, although present, was not large. A minor problem in grading was that exposure in a few cases, mainly outdoor exposure, was accompanied by surface weathering effects, such as decrease in luster, mild surface chalking, and staining.

A light-fastness rating system based on the hours of Fade-Ometer exposure required to cause "failure" (change from a "3" to a "2" grade) was employed as outlined below:

Failure between (hours)	*Light-Fastness Rating*	
0 to 50	1	poor
50 to 100	2	
100 to 200	3	fair
200 to 300	4	
300 to 400	5	good
400 to 500	6	
500 to 750	7	very good
750 to 1000	8	
1000 to 1500	9	excellent
More than 1500	10	

Since this rating, at least with dyes of better light-fastness, included a broad range of exposure time (at least 250 hrs.) slight errors due to personal bias in selecting the failure point had only minor effect.

Fade-Ometer light-fastness ratings based on the above system differ considerably from those assigned by manufacturers to specific days for anodic coatings. The performance scale used by the dye industry ranges from 1 (poorest) to 8 (best); ratings are determined by comparing the color-fastness of the dyed anodic coating with that of 8 blue textile color-fastness standards. The light-fastness in the set roughly doubles from number to number. A set of these standards and the dyed aluminum sample are exposed together, generally in a Fade-Ometer, until the dyed anodic coating shows "definite fading" or "a break." The rating of the dye is the number of the standard which has equivalent light fastness. The number 8 standard usually fades with 500 hours or less exposure. Dyes which show no "definite fading" within this period are classed as 8 although some dyed aluminum samples may require a very much longer period of exposure to cause this amount of color change.

Fade-Ometer Light-Fastness

About 75% of the dyes examined had only "poor" or "fair" Fade-Ometer ratings (Figure 1). However, among the remainder, 18% gave "very good" or "excellent" ratings, that is, exposure periods of 500 hours or more were required to cause "failure." Among this group were 5 dyes which had not "failed" even after 1500 hours of exposure.

The 17 dyes with the better light-fastness, i.e. ratings of 1 or over, were distributed unevenly among the various colors, six in the blue, two in the orange, yellow, green, violet and black, one in the red and none in the brown and grey.

INDOOR EXPOSURE:

The panels were exposed indoors under mild service

conditions. They were about 20 feet from a south "window" wall partly screened from direct sunlight by Venetian blinds and, as would be expected, they lost color at a much lower rate than those exposed outdoors. Of the dyes examined, a large number (37) failed within the first year but, during further exposure up to a total of four years, only 14 more failed. When the test was discontinued after four and a half years exposure, 64 dyes or about 56% of the total number still had a satisfactory, and in many cases excellent, color.

There was good general agreement between the light-fastness of the dyes in this test with their Fade-Ometer ratings, although some of the dyes which retained satisfactory colors indoors had Fade-Ometer ratings as low as 1.

OUTDOOR EXPOSURE:

Most of the dyed panels "failed" after outdoor exposure for one year or less (see Table 1). However,

TABLE 1

Number of Dyes Which Failed at Various Periods of Outdoor Exposure

Exposure Time (Yrs.)	No. of Failures	Distribution of Failures Fade-Ometer Light-Fastness Rating 10	9	8	7	6	5	4	3	2	1
1	84			1	2	6	2	4	13	13	43
2	7		1	1	1			1	1	1	1
3.5	8	5	1	1			1				
5	0	1*	2*						1*		1*

*Had not failed at conclusion of test.

eight dyes withstood more than three years while five still had a satisfactory, although faded, color after five years of outdoor exposure at the conclusion of the test.* The latter are listed in Table 2.

TABLE 2

Dyes Exposed Five Years Without Failure

Dye	Solution g./l.	Solution pH	Fade-Ometer Light-Fastness Rating
Aluminum Black LLW	10	3.8	9
Alizarine Sapphire SE	4	6.5	9
Quinoline Yellow Conc. 180%	4	5.0	10
Eloxan Red C-1	3	3.8	3
Alizarine Red S Conc. 110%	4	5.5	1

The outdoor exposure results showed in general good correlation with the Fade-Ometer ratings (Table 1), e.g. the majority of the dyes which failed within a year had low ratings. Ten of thirteen dyes which withstood three and a half years of the test had ratings of 8 or more. However, among the dyes which failed inside two years there were three with ratings of 8 or 9. Two red dyes (Table 2) differed markedly in their resistance to fading, depending on the conditions. Although their Fade-Ometer ratings were only 1 and 3 respectively, both had satisfactory color after five years of outdoor exposure. This particular result was of interest because dyes of this color with superior light-fastness are not common and are very much in demand.

TABLE 3

Effect of Sealant on Light-Fastness

Dye	Solution g./l.	Solution pH	Sealing**	Fade-Ometer Light-Fastness Rating	Outdoor Exposure Time to Failure (weeks)
Anodal Light Violet I	0.5	4.1	W	8	25
			N.A.5	7	36
			N.A.30	7	36
Al. Blue A	1.8	—	W	10	214*
			N.A.5	10	190
			N.A.30	10	115
Al. Gold Orange RLW	3	5.5	W	7	52
			N.A.5	10	162
			N.A.30	10	115
Al. Red GLW	4	8.7	W	3	25
			N.A.5	7	36
			N.A.30	6	36
Al. Bluish Green	5	3.4	W	5	115
			N.A.5	4	115
			N.A.30	4	25
Al. Black CL	6	4.1	W	6	52
			N.A.5	7	115
			N.A.30	7	80
Nigrosine 12525 Conc. Cryst. Metanil Yellow	12	6	W	7	36
	2		N.A.5	9	140
			N.A.30	9	162
Alizarine Sapphire SE	4	6.5	W	8	162
			N.A.5	10	214*
			N.A.30	10	214*
Nigrosine 12525 Conc. Cryst.	12	6.2	W	8	115
			N.A.5	10	52
			N.A.30	7	36
Quinoline Yellow Conc. 180%	4	5.0	W	10	214*
			N.A.5	10	214*
			N.A.30	10	214*
Eloxan Turquoise D-1	3	7.6	W	10	214*
			N.A.5	10	115
			N.A.30	10	80
Alizarine Green GXN	4	5.7	W	4	115
			N.A.5	5	214*
			N.A.30	5	214*

*No color failure even at conclusion of 214 weeks test.
**W—water sealing; N.A.5—nickel acetate solution sealing 5 min.; N.A.30—similarly for 30 min.

Influence of Sealing Conditions

Sealing in nickel acetate solution is recommended by some dye manufacturers in place of water sealing in order to obtain improved light-fastness. This treatment often slightly changes the color shade of the dyed work, indicating that the nickel acetate reacts in some way with the dyestuff which is absorbed on the oxide film.

*It should be noted here that the conditions of this test do not represent the recommended practice for dyed anodic coatings on material for outdoor exposure. Such coatings should be at least 0.001 in. thick.

The influence of this sealant was investigated in another series of tests with a set of twelve dyes, (Table 3) all of good Fade-Ometer light-fastness. Panels prepared and dyed as described above were sealed in either water (30 min.), nickel acetate solution (5 g./l., 5 min.) or nickel acetate solution (5 g./l., 30 min.). All sealants had a pH of 5.6 and were maintained at 95-100°C. These panels were exposed under the conditions of and graded by the system outlined earlier.

Comparison of the Fade-Ometer ratings and outdoor exposure results in this series for various dyes (Table 3) show the wide divergence in light-fastness characteristics of the individual dyes. Anodal Light Violet, in spite of Fade-Ometer ratings of 7-8, failed outdoors in 25-36 weeks and the method of sealing had little or no significant effect. Aluminum Bluish Green MLW had somewhat lower Fade-Ometer ratings (4-5) but the panels sealed in water and nickel acetate (5 min.) withstood 115 weeks exposure before failure occurred. The two dyes with the best light fastness were Alizarine Sapphire and Quinoline Yellow, where failure had not occurred even after four years of outdoor exposure. A slight improvement in fastness was noted with the former due to nickel acetate sealing but no sealant effect was shown by the latter. The dyes with the next best light-fastness were two blue dyes, Eloxan Turquoise and Aluminum Blue A. In both cases water sealing gave higher light-fastness than nickel acetate sealing, although with the latter dye the difference was small. Study of all the values shows that sealing in nickel acetate for 30 instead of 5 minutes did not improve the light fastness except for the mixture of two dyes, Nigrosine and Metanil Yellow.

The results indicate that the sealant effect varies with specific dyes, that it is much more important with panels exposed outdoors than with those tested in a Fade-Ometer and that Fade-Ometer ratings do not provide an adequate basis for selection (and in some cases even rejection) of specific dyes for use outdoors.

Dyes with Best Outdoor Exposure Light-Fastness

Based on a study of the results from the two investigations described above the dyes with the best light-fastness during outdoor exposure under Kingston conditions were:

Quinoline Yellow Conc. 180%
Alizarine Sapphire SE
Aluminum Black LLW
Aluminum Blue A

These dyestuffs were considered to be slightly superior to the next four, viz:

Eloxan Turquoise D-1
Alizarine Green GXN
Eloxan Red C-1
Alizarine Red S Conc. 110%

It must be remembered first, that the selection of the above dyes was based upon the specific experimental condition employed and that these, as will be discussed later, have a considerable influence on the light-fastness characteristics. Further, these eight dyes were chosen from an incomplete listing of the dyes available when this work was initiated and hence other dyes with comparable fastness characteristics may not have been included in the study. During the past few years new dyes with, it is believed, excellent light-fastness have become commercially available. Such dyes should, however, be exposed outdoors before including them in either of the two groups of dyes listed above. Further testing of a number of these dyes is now in progress.

The above two groups include three blue and two red dyes. It is possible that the three blue dyestuffs are chemically very similar or even identical. Efforts were made to use the Color Index number of similarly colored dyes to secure some basis of comparison. The results obtained were incomplete and, partly for this reason, not consistent. Analyses of dyes with proven satisfactory light-fastness by chemical and spectrophotometric method would permit useful comparisons between dyes and assist recognition of changes in dyestuff composition.

Until recently, the dyes employed for coloring anodic coatings were manufactured mainly for use in the textile industry. Loss or decrease of this field of application may lead to withdrawal of a dyestuff, e.g. Alizarine Green GXN was readily secured some years ago but it was replaced by another "equivalent" material. The substitute was recommended until commercial tests showed that its light-fastness, on anodic coatings, was greatly inferior to that of Green GXN. This is an unfortunate situation because of the heavy demand for a green dye with good light fastness.

The Light-Fastness of Organic Dyes

One theoretical objective of any coloring technique is permanence of the initial color during exposure under service conditions. However, all colors change during exposure, although some lose color much more slowly than others. This is true of colored textiles, paints, porcelain enamels, and anodic coatings. In addition, during exposure outdoors, the weathering rate depends on the material and the environment, and this affects, in some cases greatly, the color of the material.

Some of the various fading patterns typical of dyed anodic films are illustrated in Figure 2. No dyes have been found which are completely light-fast (Curve A). However, many fade slowly over a long period of time (Curve B) and, therefore, have satisfactory light-fastness. In many cases, there is a sharp initial "break" followed by a very long period of exposure with relatively little change in appearance (Curve C). Tests with

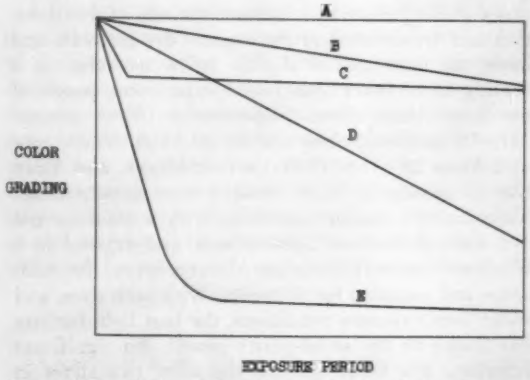


Fig. 2. Color Fading of Dyed Anodic Coatings During Exposure (Light-Fastness: A—perfect; B, C—good; D—fair; E—poor).

such dyes for only short periods or until a "break" occurs will rate the light-fastness much lower than the true value. Dyes with faster fading patterns (Curve D) will be satisfactory only under mild service conditions, while those which lose color at a very rapid rate (Curve E) should not be employed.

The light-fastness of a dyed anodic coating depends upon many variables. These include choice of suitable dye, the conditions of dyeing and also the anodizing and sealing processes, the overcoating used, if any, the exposure environment, and the extent of maintenance.

The selection of a dyestuff with a light-fastness adequate for the service application is most important. It is estimated that well over 300 dyestuffs are available for use with anodic films. A light-fastness assessment is available for most dyes in the terms of the previously described 1 to 8 rating based on blue cloth standards. The maximum rating of 8 includes some dyes with much better fastness than this test indicates. Certain dyes can be exposed for up to 2000-3000 hours and, in spite of an early break, still retain adequate color for satisfactory use. The correlation of such results to outdoor exposure behavior is usually valuable but requires confirmation prior to commercial application. With a few red dyes, low Fade-Ometer ratings may give poor agreement with their good outdoor behavior. Not only the light but also the heat and wash-fastness may be pertinent to the required performance in the intended application.

The concentration, temperature, and pH of the dye solution,[4] and treatment time affect the color and its light-fastness to a degree that depends upon the specific dye employed, e.g. the light-fastness of Aluminum Green GLW was found to be higher when a dyeing temperature of 25°C. was employed than when the normal 60-65°C. value was used. It appears that, as a general rule, the deeper the coloration the greater is the light-fastness and, thus, where possible, dyeing to the maximum depth of color is suggested to secure the best light-fastness.

The choice of alloy and anodizing conditions will influence the light-fastness. Anodic films vary in their optical and other characteristics from alloy to alloy. The coating formed on a high-silicon-containing alloy is a gray to black color depending upon the film thickness, while that produced on a high purity alloy (99.7 or higher percent Al) was a bright, transparent, silvery-gray appearance. The higher radiation absorption properties of the former may increase the rate of deterioration and decoloration of the organic dye molecule and lower the light-fastness slightly below its value on a coating of the latter type. In one experiment, panels of the three Alcan alloys [super-purity (99.99 percent Al), #3 anodizing sheet (Alcan 3S (U.S. 3003) core with Alcan 2S (U.S. 1100 type) cladding), and Alcan 33S (5 percent Si (U.S. 4043)] were anodized and colored under similar conditions with a black or red dye, both of excellent light-fastness, and exposed in a Weather-Ometer (without use of water spray) for 3000 hours and outdoors for 68 weeks. With both dyes, and under both exposure conditions, the best light-fastness was found on the super-purity panels. No significant difference was noted between the other two alloys in the Weather-Ometer test but the Alcan 33S (U.S. 4043) material showed poorer light fastness during outdoor exposure.

The kind of electrolyte is an important factor in producing dyed anodized materials. Comparison of the light-fastness of chromic acid films with sulphuric acid coatings, dyed under similar conditions, has confirmed the results reported in the literature[5,6,7] that the former are less light-fast. This comparison ignores the effect of less thickness in chromic acid coatings. Brace and Peek[8] have shown that much thicker coatings (0.0004 in.) can be produced employing a modified chromic acid anodizing process, and that the light-fastness of such dyed films is improved and is, in fact, only slightly lower than that of sulphuric acid films of equivalent thickness. They have also reported that this type of anodic film dyes readily and produces an attractive opaque appearance quite distinct from that of sulphuric acid coatings. The light-fastness increases, as expected, with greater film thickness and is influenced by the sealant employed.

The thickness of film for dyed anodic coatings to ensure satisfactory light-fastness during outdoor exposure is indicated by various specifications;[9,10,11,12] these specify thickness of 0.0008 to 0.001 in. Increased coating thickness contributes greatly to the corrosion- and weathering-resistance of anodic films, and this effect would be expected to assist in maintaining the initial appearance of colored as well as non-colored coatings. Several tests with dyes of different degrees of light-fastness have shown, in every case, that the fastness to Weather-Ometer exposure is greatly improved by use of thicker coatings produced by anodizing for 60 minutes instead of 30 minutes. In the case of Aluminum Red GLW, the exposure period required to cause failure was increased from 516 to 2400 hours. Similar trends were found with panels exposed outdoors, but the improvement due to the thicker coating was less striking and less consistent. The results were secured using saturation dyeing (20 min. at 65°C.) and the much darker color thus obtained with the thicker films increased the period of exposure required to produce "severe fading."

Variations in sulphuric acid anodizing conditions such as concentration, current density, degree of agitation, temperature, etc. may have small but appreciable effects on the light-fastness. Raising the temperature from 21° to 25°C. will darken the color of the dyed film due to greater porosity and, in some cases, increase the light-fastness.

The sealing operation is of fundamental importance in producing anodic coatings with the required corrosion resistance and, if dyed, with improved light-fastness. The two sealants commonly employed with dyed coatings are water and nickel acetate (or cobalt acetate) solution. The choice between these will depend upon the dye employed. Water sealing affects only slightly the color shade and, with some dyes, gives better light-fastness. Nickel acetate sealing as mentioned earlier may change the shade slightly, due probably to the formation of a nickel-dye complex and should be restricted to those dyes where it produces light-fastness higher than that obtained with water sealing. It is well known that the sealing time, temperature, and pH of the sealant are also critical factors in the operation. A

variant of the sealing procedure in order to minimize "chalking" is to first "fix" the dyed coating with a short immersion in a nickel or cobalt acetate solution at a temperature of about 70°C., slightly above the dyeing temperature, followed by water sealing under normal conditions.[13]

The usefulness of other salt solutions as sealants to increase the light-fastness has been investigated by Speiser.[14] Lead acetate, copper sulphate, or chromic sulphate salt baths were found to be moderately advantageous with some dyes. The possible value of potassium dichromate solution (50 g./l.) sealing is also of interest because of the superior corrosion resistance of the sealed oxide coating that is produced. However, the color of this sealant usually modifies the shade of the dyed color in an undesirable manner. The effect is less pronounced with red and orange colors and can be reduced further with little or no loss of corrosion resistance by use of a more dilute solution.

Dichromate sealing was found to increase about three fold the light-fastness of three red dyes, Calco Red SCN, Calcochrome Alizarine Red S. Conc. and Alizarine Red S. Conc. The above results were obtained on Fade-Ometer exposed panels and no outdoor exposure results are available. However, the use of corrosion-inhibiting salt solutions as sealants appears to have important advantages for dyed panels exposed outdoors and warrants further study.

Lacquer or wax overcoatings on dyed anodic films initially were used to maintain the surface appearance against damage during shipping and erection. The development of non-yellowing, clear lacquers with improved weather-fastness has made it possible to obtain additional light-fastness by application of thick lacquer coatings with a service life, depending upon exposure conditions, of several years.

The effect of exposure conditions and the maintenance provided on the light-fastness of dyed anodic coatings is more important than is often realized. Variations in sunlight, rainfall, and temperature will affect this relationship. Another factor is the amount of atmospheric contamination such as soot, dust, and sulphur gases which are found in urban and industrial environments. These will tend to mask the color and also produce a slow but appreciable weathering attack which will cause additional loss of color. Frequent cleaning, and if not already lacquered, preferably application of a thin lacquer or wax film, will aid greatly in preserving the initial color.

Light-Fastness Standards

Dyes recommended for use with anodic coatings are rated by their suppliers in terms of their light-, heat- and wash-fastness, as determined by standards and tests which may vary with the individual manufacturer. The cloth light-fastness standards cover the range required for textile applications, but additional standards of higher fastness are required to permit selection of the dyes for anodic films with superior light-fastness for possible outdoor exposure. It is again emphasized that even dyes which exhibit superior light-fastness under accelerated testing conditions require outdoor tests to confirm that their light-fastness will be adequate during service. Several dye manufacturers have begun to secure and make available outdoor test results on a few dyes selected because of their good light-fastness This is an encouraging step, and particularly so if it is adopted by the other dye supply houses.

Another difficulty in light-fastness testing, whether by Fade-Ometer or outdoor exposure, is to determine when "definite fading" or a "break" in color first occurs. It has been reported[15] that this point can be defined more readily when a standard grey scale* is employed. This provides several pairs of paper chips showing progressively increasing grades of contrast between a dark grey and a light grey chip. A specific grade can be selected with which the color contrast between the non-exposed and the exposed color of the anodic coating can be compared. Exposure is continued until this grade of contrast is reached. Other convenient ways of using this grey scale readily suggest themselves, e.g. another grade on the grey scale could be used to determine the point of "failure." The qualitative method described earlier has proved convenient and adequate for this determination but is less precise and reproducible than is desirable. Also, differences in texture, gloss, and color between the dyed coating and the dull paper chips are objectionable and make some experience necessary to obtain successful comparisons.

As a result of the difficulty in defining light-fastness, some acceptance specifications[12] dealing with the use of dyes for outdoor exposure are accompanied by a list of dyes selected because of known satisfactory performance.

Recommended Procedure for Outdoor Exposure

The results discussed above suggest six main factors essential to secure maximum service life with dyed anodic coatings exposed outdoors:

1. *Selection of Dyes with Maximum Light-Fastness:*

It is essential to employ only dyes of which light-fastness has been proved adequate by outdoor exposure. The value of certain inorganic pigment coloring techniques such as ferric salt solutions should not be overlooked.

2. *Film Thickness:*

A minimum film thickness of 0.001 in. is strongly recommended to ensure maximum color-fastness and superior weathering-resistance of the anodic film.

3. *Processing Conditions:*

A standard processing procedure must be established to provide consistent high quality and the desired color of the anodic coating. This will include all cleaning, rinsing, anodizing, dyeing, and sealing procedures. Variables such as electrolyte concentration and temperature, degree of agitation, current density, and anodizing time are particularly important. The control of dyeing conditions, concentration, pH, temperature, agitation and time is vital. With certain dyes the "drag-in" of acid and dissolved salts from the anodizing electrolyte must be rigorously prevented. Sealing should be

(*Continued on page* 61)

*A scale such as the "Grey Scale for Evaluating Changes in Color (proposed I.S.O. Recommendation) as specified by Society of Dyers and Colorists.

Trends in Waste Disposal

By Dr. D. Gardner Foulke, *Mgr., Electrochemical Development, Hanson-Van Winkle-Munning Co., Matawan, N. J.*

FOR a number of years the plating fraternity has been hearing of the problem of waste disposal and some have been facing increasing pressure with respect to waste treatment. On the other hand, many platers have listened to warnings contained in speeches and articles and have begun to wonder, not having yet been pressured, whether the cry, "wolf, wolf," has not been the order of the day. Not a few have found out that this is not true. Many have been fortunate up to the present moment. Geography is a mighty ally.

Just what are the present trends with respect to waste treatment in the plating business? A recent poll of those active in this field revealed that, although there is no distinct predominance of thinking in any specific direction as far as waste treatment is concerned, there is an encouragingly intelligent approach to each specific problem (and each problem is specific in our industry) which is resulting in an insistence that the system adopted meet the requirements of each situation. This, undoubtedly, has resulted from the considerable number of papers published and talks delivered in recent years — many by authors well grounded in plating who became interested in waste treatment as it became apparent that this problem was one of the greatest importance. As a result, the plater has taken steps to reduce his problem to a minimum before calling in his supplier or a consulting engineer. Here then is the trend in waste treatment in the metal finishing industry — a better understanding of the problem, generally, leading to the taking of as many steps as possible to reduce the problem to a minimum. This is followed by a willingness to move in the direction of pollution abatement on an over-all basis. *Waste treatment has become waste control and water conservation is rapidly entering the picture.*

Fig. 1. Fog Rinse.

Approach to the Problem

This brings us to the fact that the basic philosophy of waste disposal is tied to water and water conservation. There is usually only one place to dispose of wastes — our waterways. This is not too great a problem at present for the east and west coasts, but there is an immense amount of industry between the Atlantic and Pacific oceans.

The prime reason for waste treatment is that waterways are used by somebody downstream and they have every right to receive water as pure as the fellow upstream. This philosophy was well expressed by the Surgeon General of the United States, Hon. L. Burney, who pointed out, at the most recent meeting of the National Technical Task Committee for Industrial Wastes, that the Department of Health, Education and Welfare recognizes the problems of the states and the national government with respect to industrial wastes. He called for the cooperation of the states and industry with the Public Health Department, but he also pointed out that the Health Service has a definite responsibility under the law.

Larger companies recognize the importance of a good supply of water and the need to treat effluents.[1,2] In fact, they have rolled the whole matter into one ball of wax under *water management.* Admittedly, the small plater cannot set up a water management department, but he can take advantage of many things which will conserve water and save money as well.

There has been considerable discussion, even in the east, with respect to the problem of future water supplies. The Dep't. of Commerce Business and Defense Services Administration reports that water consumption in 1980 will jump to 490 billion gallons per day versus 262 billion gallons per day for 1955. The plater, as a relatively heavy user of water, must be interested in knowing from whence will all this water come?

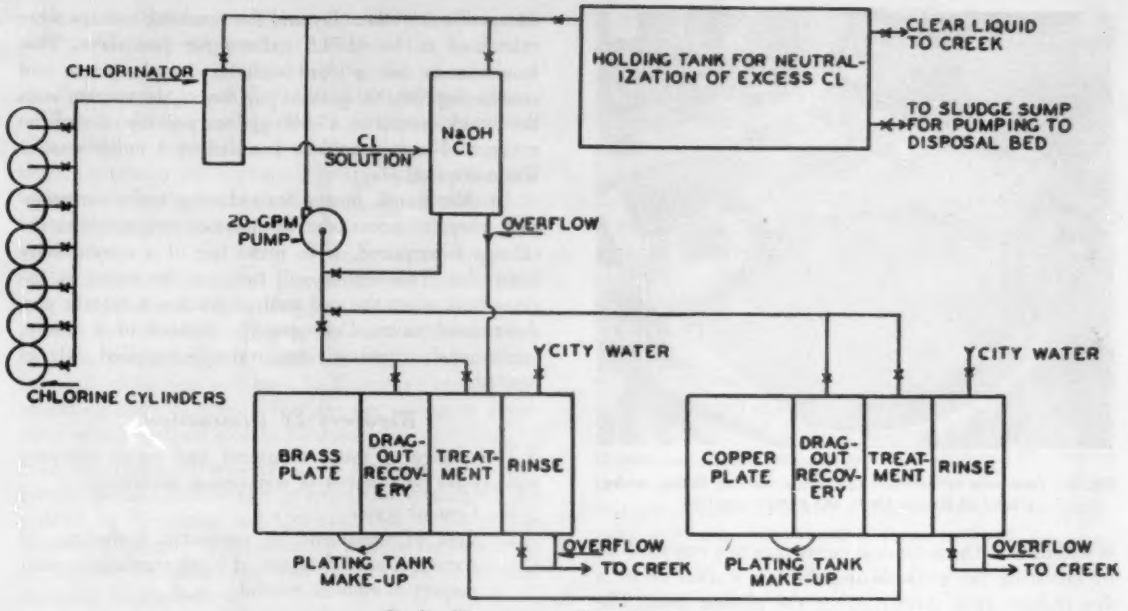


Fig. 2. Diagram of cyanide treatment system.

Unless surprising developments occur in the field of desalting sea water, we shall have to rely on:

1. Economic use of water.
2. Control of effluent water.
3. Storage of run-off water (reservoirs, local government).

All three methods can be actively supported by the plater. All three are steps that must be taken. It is interesting to note that the first, the economic use of water, is not only a concern of the semi-arid southwest U.S.A., but of interest globally. Witness the meeting in the summer of 1957 of the Water and Sewage Division of the International Union of Pure and Applied Chemistry in Paris. The author was privileged to attend, and the economic use of water in many industries was discussed. This and the control of effluent water are areas for direct action by the plater and such action starts with plant design itself.

In wet-process industries — electroplating is one — multiple sewer systems often can be justified. Of course, each plant must be studied on its own merits but, ideally, the following possibilities should be considered:

1. A sewer system for uncontaminated water — storm water and cooling water which can be reused.
2. Sanitary wastes.
3. General process wastes.
4. Special purpose waste lines — cyanide, chromic acid, etc.

This is idealized and cannot always be justified, particularly where all plating wastes can be discharged into a city sewer. But, in rural areas and when discharging to certain streams, many of these steps must be taken, and even more. The general process waste sewers may consist of lines for acid and for alkaline effluents and they should empty into a holding tank to equalize the wastes discharged (24 hour the ideal, rarely reached).

The special purpose waste lines in one case would lead from counter-current rinse tanks to a recovery area where nickel salts, chromic acid, copper cyanide, etc., would be salvaged by ion-exchange or multi-stage evaporation and the water re-used. Or, in the other case, the lines would lead to treatment tanks.

Whether the waste water is to be treated subsequently in terms of recovery of values or destruction of toxic components, segregation of wastes, good housekeeping practices and water control are important.

Water control begins with the installation of meters, followed by insistence on good housekeeping and the adoption of a general program based upon good engineering principles.

Water and material losses are usually associated with drag-out losses, although a surprisingly large amount of nickel salts can be lost by poor maintenance of pump packing and piping, in general. Over-all control includes a running story on salt additions. Great variations in consumption should be explained.

Engineering factors to be considered are:

Proper rinse tank design
Drag-out control
Save and Multiple rinses

TANK DESIGN:

The rinse tank should be provided with a dam overflow at the entrance end and the water should not enter at the top of the tank. Best design calls for the water entering under pressure from a manifold at the bottom of the entrance side and air at the bottom of the exit to give good mixing.

DRAG-OUT CONTROL:

Steps that can be taken to decrease drag-out include a reasonable drainage period over the tank when work

(Courtesy Buick Motor Div., G.M.C.)

Fig. 3. From top to bottom: Raw waste holding basins, underground oil storage tanks, and primary clarifiers.

is withdrawn. On automatic conveyors this can be done by elevating the work during the last station or by a dry reclaim tank directly after the plating tank. The use of timed spray or fog rinses at the exit end of the plating tank is also helpful. And, of course, the insertion of drip pans between the rinse and the plating tank, draining back into the latter, should always be used.

RINSES:

The use of a reclaim rinse as the first rinse step after the plating operation is now widely practiced, especially following heated solutions. The rinse then is regularly pumped back into the plating tank to replace water lost by evaporation. Of course, little is gained if the reclaim is allowed to build up in salts to the point where drag-out from the save-rinse approaches that from the plating tank itself.

It has been shown that multiple rinse, either counter-current or parallel, can greatly reduce water consumption and the effluent problem.

The counter-current system is most useful when recovery of chemicals and water is being practiced. One of the best examples of this approach was described by Weisberg and Quinlan. With a flow rate of 1 to 1½ gallons per minute, the cyanide content (as HCN) in the four tanks ran 2145, 157, 11 and 5 ppm. The counter-current system followed a zinc plating operation. This demonstrates the kind of concentration which can be obtained and the relatively clean rinse water obtainable in the last rinse tank.

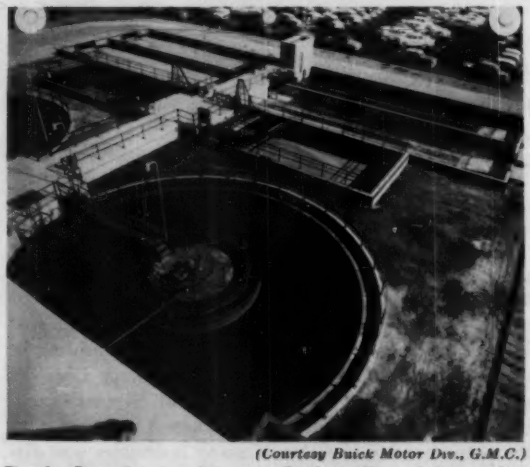
The use of parallel rinses can make for surprising savings in water consumption. Studies reported at the June 26th, 1953 meeting of the New York Branch of the A.E.S. showed that a 96% water savings could be accomplished. The authors, J. Hendel, George Herrmann and Daniel Marino, accumulated experimental data using 20 gallon rinse tanks in which they showed that the concentration curve for the single rinse tank (flow at 4.5 gpm.) crossed a similar curve for the third tank of the three-tank (0.03 gpm. each) parallel rinse system after six days. After providing a healthy margin of safety it was proposed that each rinse tank be dumped every other day and the resulting savings were calculated to be 4173.6 gallons per two days. This would mean that a plant with the 1-tank system and consuming 500,000 gallons per day could operate with the 3-tank system on 17,000 gallons per day — and the amount of waste could be handled by a much smaller waste disposal plant.

Another simple means for reducing water consumption where no great control of toxic compounds in the effluent is required, is to make use of a conductivity controller. This device will turn on the water in the rinse tank when the salt content reaches a certain predetermined value. Consequently, instead of a wildly, continuously running rinse, water is supplied only as needed.

Recovery or Destruction

The choice of waste treatment and waste recovery will always be a matter of economics, involving:

1. Cost of water.
2. Cost of treatment vs. recovery; including, of course, a consideration of local regulations with respect to effluent control.



(Courtesy Buick Motor Div., G.M.C.)

Fig. 4. From foreground to top: Final clarifiers, sludge settling tanks and sludge beds.

The lack and concomitant high cost of water has made it necessary for many high-water consuming industries to go to a totally enclosed system of water use. Perhaps the best example of American re-use is the Kaiser plant in California, where 1,400 gallons of water per ton of steel is used, compared to the 65,000 gallons/ton average in this country. It might be added that at least one French plant uses as little as 1,000 gallons per ton. The totally enclosed (all water re-used) approach is not widely practiced in the United States as yet — certain steel and petroleum industries approach it, but most ignore it. As a matter of fact, at a recent meeting of the Industrial Wastes Committee of the N. J. Sewage and Industrial Wastes Assn., it was decided not to try to get a paper for the annual meeting on "Water Re-Use" because there was not enough activity in the area at this time. However, this is hardly justification for one to say that "wolf" is being shouted unnecessarily. The projected water consumption figures are valid; consequently, many things must be done in the next twenty years.

Certainly, there is no excuse not to take the necessary preliminary steps now to reduce water consumption and contamination by adopting the principles of good engineering and housekeeping outlined above.

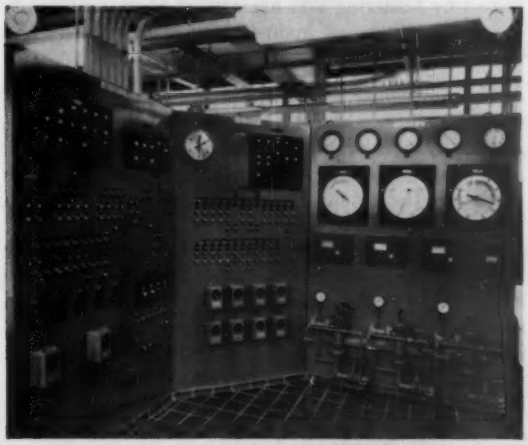
Having taken these steps, it is a matter of economics as to whether destruction or recovery should be practiced. Certainly, the operating cost in either case will be less and, furthermore, it will easily be possible to go from destruction to recovery when economics so dictate.

Certain plants in outlying areas of New Jersey have moved to Newark where they can send their effluents directly to the sewer. This is an easy solution when possible, but it is not a universal one. In most cases, for each plant, one will have to determine capital and operating costs vs. day-in and day-out saving to determine which method should be used.

In the realm of recovery, two methods have been found useful. Multi-stage evaporation has been described by Weisberg and Quinlan. Ion exchange has been used for certain applications both to recover and/or remove contaminants, and to treat baths so that dumping is eliminated.[4,5]

In some cases, a combination of ion exchange and evaporation has advantages. Kilmer and Jordan described an installation at the 1957 Purdue Industrial Waste Conference wherein the rinse water from the first of a series of four counter-flow rinse tanks following a chromium plating tank is directed to a storage tank. The contaminated chromic acid is then passed through a cation-exchanger to a pure chromic acid storage tank and fed to an evaporator. The distilled water obtained is fed into the rinse tanks and the concentrated chromic acid added to the bath as needed from a storage tank.

An interesting application of the recovery approach has been the concentration of nickel solution, instead of the customary reclaim rinse feed-back into the plating bath. When evaporation from the nickel bath is insufficient to permit sufficiently rapid return of the reclaim rinse to the plating tank, a system such as has been described by Hesler[6] is useful. Weekly recovery of 2,800 pounds of nickel salts is at a cost of about 2 cents per pound vs. a nickel salt price at the time of 30 cents.



(Courtesy Buick Motor Div., G.M.C.)

Fig. 5. Central control panel located on first floor of main control building.

In each instance, however, plant conditions must be considered. If the nickel bath can be operated at high enough temperature, the reclaim rinse method may be sufficient.

Present day treatment (destructive) methods are rather standard, so that they will be touched upon only briefly. The part-of-the-cycle waste treatment described at the 1952 A.E.S. convention by Milne,[7] and called the integrated system by Lancy,[8] has found its place in the treatment of metal finishing wastes. A schematic of this approach[9] is shown in Figure 2. The virtue of such a system lies in the simplicity and effectiveness of the method.

Waste treatment can be as simple as the integrated system just described or it can involve mighty facilities such as installed at General Motors Buick[10] plant (Figs. 3, 4, 5). Each situation requires consideration of all the factors involved — a package deal is not now in the cards. In any event, making every effort to reduce waste and conserve water is the first step in an intelligent approach to the waste disposal problem.

Conclusion

Water — our greatest natural resource — should be considered just that by both large and small industries, if only because water costs money and water saving means dollar saving. Consequently, the plater should take advantage of every possible method to cut down water costs and this *per se* means stopping waste at the source. And, when it becomes necessary for effluents to meet regulatory criteria, the plater should hard-headedly determine whether destruction or recovery is indicated in his case.

In any event, as noted by Blucher Poole, technical secretary, Indiana Stream Pollution Control Board, in the October, 1957 issue of *Sewage and Industrial Wastes*: "No one has a greater stake than industry in the management of water resources." As part of American industry, the plater cannot help but assume his responsibilities along with those other groups which constitute the greatest industrial force the world has known. It is sobering at the same time to remember how important water was centuries ago when the Psalmist said: "He sendeth the springs into the valleys, which run among the hills, He causeth the grass to grow for the cattle and herb for the service of man." Or the quotation from the Koran: "No man can refuse surplus water without sinning against Allah and against man." However, the surplus water should not contain 100 ppm. of cyanide or 50 ppm. of chromate ion.

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Finishing Zinc Base Die Castings

By Lester Spencer, *Finishing Engineer, West Allis, Wis.*

Introduction

DIE castings are among the most important quantity production items that are manufactured by the metal working industry. They rank with stampings, sand castings, forgings, and screw machine products in general value and usage. Thus, die castings are used extensively in consumer and industrial products, as exemplified by automobiles, home appliances, electrical products, office and store equipment, small tools, photographic equipment, instruments, etc. In fact, die casting applications are stated to cover a broader range than almost any other metal form.

Die castings are made from non-ferrous metals which, for the sake of simplicity, can be classified into low-melting point and high-melting point groups. The low-melting point alloys would include those of zinc, lead, and tin base, whereas, the high-melting point group would include the aluminum, magnesium, and copper base alloys. Zinc is the most important of these metals so far as die castings are concerned, and currently accounts for about two-thirds, by weight, of all die castings used. Chemical compositions of standard zinc-base alloys, in accordance to ASTM Specification B86-46, are given in Table 1.

TABLE 1

Chemical Composition of Standard Zinc-Base Alloys (ASTM B86-46)

	Composition — %		
Element	*Alloy XXI*	*Alloy XXIII*	*Alloy XXV*
Copper	2.5 to 3.5	0.10 Max.	0.75 to 1.25
Aluminum	3.5 to 4.5	3.5 to 4.3	3.4 to 4.3
Magnesium	0.02 to 0.10	0.03 to 0.08	0.03 to 0.08
Iron	0.10 Max.	0.10 Max.	0.10 Max.
Lead	0.007 Max.	0.007 Max.	0.007 Max.
Cadmium	0.005 Max.	0.005 Max.	0.005 Max.
Tin	0.005 Max.	0.005 Max.	0.005 Max.
Zinc	Remainder	Remainder	Remainder

In comparing die castings with other fabricated forms, this method of producing component parts possess, as a class, the following advantages:

1. In the event that many thousands are required, it has the advantage of rapid production from a single die with only slight and usually insignificant dimensional shape.
2. Producibility within dimensional limits so close that little or no machining is required; this being of particular value for complex shapes.
3. Smoother surfaces, as cast, than for any other type of casting.
4. Permissible section thickness lower than for many other cast parts, and as thin as for many stamped parts.
5. Ease of production with inserts of other metals and with some non-metallic inserts.
6. Comparative ease of plating and the use of other finishes.
7. Low labor cost per casting, lower material cost than for most non-ferrous castings and, minimum scrap loss.

Polishing and Buffing

The die casting analyses, as given in Table 1, are characterized by a dense, fine-grained structure. The retention of this structure during a finishing sequence is of extreme importance and, since this characteristic is little more than a skin effect, particular care must be given to both polishing and buffing procedure. These small grains are due to the chill effect imparted by the steel mold from which the die casting obtains its shape and, metallographic examination of a cross section would reveal a thin layer that is comparatively hard. Usually, the cooler the die surface, within practical die casting limits, the smaller will be this grain size. Conversely, as the metal within a section thickness is further away from the die surface, metallographic examination would reveal that the grain size becomes larger and, usually, this is accompanied by an increase in porosity of the metal. If the surface finishing operation, such as polishing, is sufficiently severe to cut through this dense skin, plating difficulties, as exemplified by blistering and haziness of plate, may result, the extent depending upon the extent of porosity and the efficiency of the cleaning cycle.

There are other blemishes that may exist on the surface of a die casting which may cause concern to the plater, the more prominent of which would include run pattern, cold shuts, solder spots and blisters. A run pattern is the result of metal flow during solidification. While this pattern is usually not noticed on the raw casting, it may be seen on occasion on items that have been highly buffed or plated. A cold shut, which is caused by two or more converging streams of metal which are too cool to completely mix and so solidify, is identifiable by a curlicue pattern. This area, which may be quite porous, may become a void after polishing and buffing and is frequently the cause of blisters, rough plate, and pits. In some instances, the void may be completely hidden after buffing only to "open up" during a cleaning cycle.

TABLE 1A

Relationship Between Lineal Speed, Speed of Rotation and Wheel Diameter

Diameter of Wheel: inches	Revolutions Per Minute to Give: 4,000 ft./min.	5,500 ft./min.	8,500 ft./min.
4	3,800	5,250	8,100
6	2,550	3,500	5,400
8	1,900	2,600	4,000
10	1,550	2,100	3,250
12	1,250	1,750	2,700
14	1,100	1,500	2,300
16	960	1,300	2,000
18	850	1,165	1,800

Solder spots are caused by small droplets of metal that splash against the surface of the die prior to the arrival of the main flow of metal. These spots sometimes are removed by buffing; however, the more serious condition is the loosening of the droplet by the tension of the plated metal. Entrapped gas near the surface of the casting is usually the cause of blistering. Although this condition is frequently noticed directly after casting, it may not develop until after the plating operation. This latter condition is noticed after sufficient tension is developed to lift the thin zinc layer from the remainder of the casting. This type of blister can be distinguished from a typical plating blister,[2] since it is quite hard, while the plating blister in the thin decorative plates is springy. Another means of identification is that a casting blister is usually small and spherical in shape, while a plating blister may be of any size and shape and, where the hard blister is broken open, a thin layer of zinc peels away from the parent die casting. This type of surface defect is stated to be caused by too high a temperature of the die during casting.

In general, die castings often can be buffed without polishing; the only exception is the use of polishing in removing parting lines or "flash." Polishing parting lines may normally be done on either set-up wheels or abrasive belts. To obtain the most rapid cutting, the coarsest abrasive size should be used that will permit the desired final smoothness after a subsequent buffing operation. A grit size between Nos. 180 to 220 is usually employed which, when used with a suitable lubricant, will produce a satisfactory finish. Although the linear speed of either a set-up wheel or an abrasive belt will vary from plant to plant, the speeds normally recommended will range from 6000 to 8000 sfm for set-up wheels, and, from 5000 to 7000 sfm for abrasive belts.

In the event that die castings, due to the surface condition of the metal, should require an over-all polishing prior to buffing, a fairly fine aluminum oxide grit, set-up with glue and oiled out with tallow stick is normally employed. In this type of operation, it is very important to avoid cutting through the "skin" surface. It is recommended that the polisher stroke in a downward direction only since there is a tendency to tear the metal with an upward pull. Continuous belts of various grits have also proven very successful and may be used as an alternate polishing method. However, it is usually necessary that such belts be oiled out with a suitable belt grease.

Buffing of zinc die castings is carried out on sewed or pocketed buffs; a high thread count (86/93) buff of the bias type being usually recommended for "cut-down" buffing. A lubricant such as a bar or liquid type Tripoli composition is used. When needed, "color" buffing is usually carried out after cut-down buffing on a loose full-disc buff. Buffing operations are usually carried out at a linear speed of between 7000 and 9000 sfm, although, slower speeds of the order of 3500 to 5000 sfm are used in many plants.

Zinc die castings can be mechanically buffed to a

TABLE 2

Case Studies in Finishing Zinc Base Die Castings

Product	Type of Operation	Buffs (or Wheels)	RPM	Lubricant
Automotive Door Handles	Polishing (Flash Removal)	180 grit belt; 12" diam. contact wheel	1750	Belt Grease
	Buffing	16" Bias 86/93	2100	Tripoli
Name Plates	Buffing	14" Bias 86/93	2100	Tripoli
Refrigerator Handles	Buffing	14" Bias 86/93	2100	Tripoli
Automatic Fishing Reel	Polishing (Satin Finish)	10" Full Disc 64/64	1750	Greaseless Composition
Automotive Grill Parts	Buffing	16" Bias 86/93	1750	Liquid Tripoli
Lamp Parts	Polishing	Muslin Buff with 3/8" sewing	5500 sfm	Greaseless Composition
	Cut-down Buff	Pocketed Buff	7500 sfm	Buffing Compound
Padlocks	Polishing (Flash and Imperfection Removal)	Muslin Buff	5500 sfm	Greaseless Composition
	Cut and Color Buff	Muslin Buff	7000 sfm	Buffing Compound

high finish; however, it should be realized that, unless the surface is protected, tarnishing will occur more quickly and be more noticeable than on untreated parts. For this reason, mechanical finishes are seldom used, except as a preparatory step for other types of finishes. If the die casting is permitted to obtain a heavy oxide film, difficulty will be experienced in its removal. In addition, lime compositions should be avoided since insoluble precipitates are formed which are subsequently difficult to remove in the cleaning cycle.

Polishing, buffing and coloring operations must be properly graduated or else a poor surface or the necessity of an additional operation may result. In addition, the subsequent cleaning cycle will be greatly simplified if care is given in the buffing operation. Suggested precautions would be the selection of a buffing compound that has a readily emulsifiable or saponifiable binder, and that excess compound be wiped off to prevent packing into holes and recesses within the casting. It may be well to observe some of these simple rules, since a reduced demand on the pre-cleaning cycle will result. Typical polishing and buffing jobs are given in Table 2.

The Cleaning Cycle

The use of a pre-cleaning operation is strongly recommended since the distribution of soil on the die casting may vary considerably. If the die casting should be subjected to a cleaning operation, such as an alkaline electrocleaner, it is possible that light soil in a specific area may be removed quite readily; however, due to a heavy soil on another section of the casting, the time required for its removal may cause an overcleaning in the former mentioned area. Zinc surfaces are quite sensitive to alkali and care must be taken to avoid prolonged contact if blistering of copper primary coats are to be avoided.

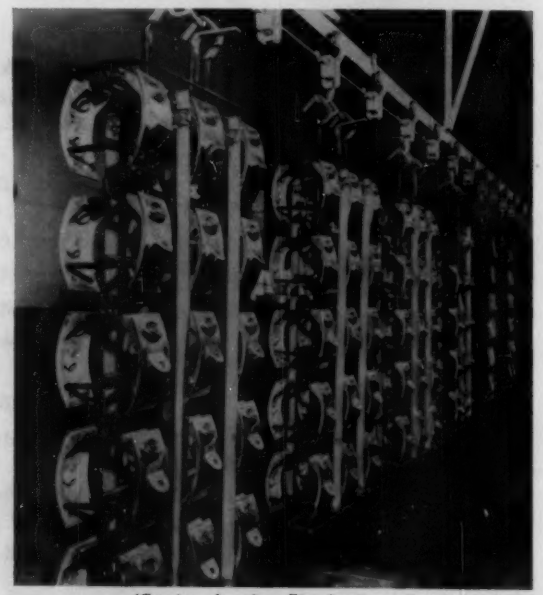
The complexity and cost of a pre-cleaning cycle will vary with the type, distribution and character of the soil to be removed. The most satisfactory soil is one that has a uniform film of grease which may be easily removed by a simple degreasing followed by electrocleaning. However, under the most adverse soil conditions, a hard caked, sometimes a partially carbonized buffing compound will be packed into holes and recesses; this requiring a complex pre-cleaning cycle which may include hard scrubbing. Although it is difficult to give specific recommendations as to the pre-cleaning cycle to be employed, greasy soils can be removed either by solvent degreasing, emulsion cleaning, or cleaning with a detergent.

A vapor-spray-vapor cycle may be used in solvent degreasing operations utilizing either manually operated or conveyorized equipment. If a large amount of buffing compound is present, the time of exposure to the vapor (first step) is kept at a minimum, after which immediate spray impingement is used. The final vapor rinse is long enough to allow the temperature of the metal to increase to that of the vapor. Spray pressure, coverage, and temperature will vary and, in particularly stubborn cases, it may be desirable to lengthen the treatment to a vapor-spray-vapor-spray-vapor cycle. Trichlorethylene is the commonly used solvent, which must be inhibited to prevent the finely divided zinc from catalyzing the decomposition of this solvent, to produce harmful free acid. Frequent or continuous distillation is very important to avoid acidity. Carbon tetrachloride is another solvent that may be used; however, it is more toxic than trichlorethylene and, in some states, its use is prohibited.

Heavy and caked buffing compounds can usually be softened and removed by various proprietary emulsion type cleaners, but there is a danger that the emulsion ingredients will be carried over in subsequent operations. This frequently results in dull, non-uniform, spotty copper plate, and poor adhesion of any additional plate. The contamination is accentuated with torn or cracked rack coatings or flaky rough deposits built up on the racks, since these conditions will increase the danger of carry-over. Emulsion-cleaned castings should be given an adequate alkaline cleaning followed by a thorough rinsing before copper plating.

Another method to soften and loosen packed soil deposits is the use of a detergent in either a soak or spray cleaner; the latter being preferred since forced spraying will add a mechanical action that will aid in the removal of soil. Soak solutions should be as neutral as possible and the time of immersion should also be at a minimum. The selection of the detergent is important since the resultant thin film of soil on the casting should be readily removed by subsequent rinsing. A fourth method of removing packed compound is ultrasonics with solvent or cleaner. This method is fairly new showing a great deal of promise.

Usually the above pre-cleaning operations does not completely remove all of the soil. A frequently used tool for soil removal is electrolytic cleaning. A wide variety of proprietary compounds are available with some designed for use in cathodic cleaning while others are designed for anodic cleaning. While both types are widely used in commercial practice, anodic cleaning is



(Courtesy American Zinc Institute, New York, N. Y.)

Zinc die castings are racked and placed on overhead cable conveyor for transporting to cleaning line. Racks in foreground are equipped with special bar anodes (vertical strips) to increase throwing power in chromium plating.

(Courtesy American Zinc Institute, New York, N. Y.)
Zinc die castings (panel board) copper plated and ready for subsequent nickel and chromium plating.

the preferred since the resultant stains are more readily removed by a subsequent acid dip. The detrimental effect of alkali on zinc die castings is again emphasized since a poor sequence of pre-cleaning and electrolytic cleaning may result in damage. An electrocleaning operation may be safe, following an operation such as trichlorethylene degreasing. However, where a soak cleaner is used, this same electrocleaner may not be satisfactory, since the cumulative alkalinity effect of this combination may result in attack. This is particularly accentuated where long immersion times are realized in some types of automatic conveyor equipment. This adverse effect may be easily minimized by either reducing the cleaner concentration, reduction of the temperature of operation of the electrolytic cleaner, or by using a milder cleaner as the electrolyte. Hot and cold rinses should follow, good practice dictating that both spray and dip rinsing be employed.

When alkaline cleaning is employed, the time factor of immersion is the critical variable. Thus, die castings should not be exposed to strong cleaners for more than 10 to 20 seconds. This type of cleaner would not be suitable for use in conveyor units. An acid dip should follow alkaline cleaning. When the dipping time is limited to about 5 seconds, a 5 percent solution of hydrochloric acid or sulphuric acid may be used. In a conveyor system, where the dipping time is longer, the concentration of the acid should be 1 to 2 percent or less. Copious gas evolution on the surface of the casting during acid dipping should be avoided. Usually the work should be immersed until gas evolution just begins. Very dilute alkaline cleaners and acid dips should be changed as frequently as every 24 hours.

The importance of good cleaning practice cannot be over-emphasized since failure will result in separation of plate usually in the form of blisters. When the cleaning cycle is inadequate, the underside of the blister will have a red coppery surface,[1], whereas, if the part has been over-cleaned, the back of the detached particle of the coating will appear gray. This latter condition is due to the formation of white-gray alloys obtained by diffusion between the zinc and the copper plate and the separation of the plate through these alloys.

(To be continued next month)

LIGHT-FASTNESS OF ORGANIC DYES

(Continued from page 53)

for an adequate period at temperatures over 98°C. and at the correct pH. The quality of the "make-up" water is critical. Unless adequate control of processing conditions is provided, it is difficult to ensure the required consistency of the color or of its light-fastness.

4. *Lacquer Coating:*

The application of a clear approved-type lacquer film, of 0.001 in. thickness, to the dyed anodic coating is valuable in maintaining the initial color during erection and during the initial period of exposure and will increase appreciably the service life of the dyed coating.

5. *Exposure Location:*

Variations in atmospheric conditions, such as the hours of sunlight, amount of precipitation, and degree of pollution will greatly affect the color and its light-fastness.

6. *Maintenance:*

In severe exposure locations periodic cleaning and maintenance is essential in maintaining the initial appearance and color.

The service performance of colored anodic coatings will vary greatly depending upon numerous processing and exposure factors. The performance data available[16] as yet are not extensive and cover relatively short periods of time. The results available from experience in North Europe, South Africa, and the United States suggest that, when correct processing conditions are employed, adequate color can be maintained for minimum periods of 7-15 years.

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Electroforming with Plating Cells

By Dr. E. B. Saubestre, *Central Research Laboratories, Sylvania Electric Products, Inc., Bayside, N. Y.**

PLATING cells are normally used to examine a range of current densities on a cathode, so as to determine the condition of a given plating, electropolishing, or anodizing solution. The most common type of plating cell is the Hull cell,[1] which displays a logarithmic distribution of current density along the length of the test panel. A more recent plating cell is the Walton-Gilmont cell,[2] which produces a linear increase of current density along the test panel.

Such plating cells can also be used in electroforming applications, in lieu of conforming, or specially designed anodes, thieves, and masks. An example of such a use arose in the writer's company, in connection with production of components for microwave tubes. It was desired to plate a truncated wedge (Fig. 1). Since the parts were small, it was decided that the simplest way to do the job was to design a plating cell that would produce such a deposit. The solution to the problem was basically a modification of the Walton-Gilmont cell.

The latter cell is based on the principle that a hyperbolic anode can deposit plates in the form of a linear wedge. Since the iso-current lines are normal to the potential lines, they constructed their cell by using a hyperbolic anode, a plane cathode, and used the normal hyperbolas for the insulated sides of the cell, using the 45° angle line for one of these sides to simplify construction problems (Fig. 2).

In order to produce the type of plated wedge shown in Fig. 1, two Walton-Gilmont cells were used, back-to-back, and shown in Fig. 3. In order to get the truncated feature, a suitable iso-current line is used in lieu of the 45° angle line (which corresponds to zero current), as shown in the figure. The ratio of a to L in Fig. 3 determines the degree of truncation of the wedge, x_1 to x_2, in Fig. 1. Specifically,

$$\frac{a}{L} = \frac{x_1}{x_2}$$

In building the cell, the equation which describes the left hand side is:

$$x^2 - y^2 = a^2,$$

where the origin for x and y is shown in Fig. 3. The equation of the left hand portion of the anode is:

$$xy = L^2/2$$

between the following limits: beginning at the point of intersection with the line $x^2 - y^2 = a^2$, and ending at the point $y = L/2$, $x = L$. The right hand side of the cell is a mirror image of the left hand side.

Before beginning actual construction of this cell, it was decided to test its validity by the method of Kinney and Festa.[3] In this method, the shape of the cell is cut out on uniform resistivity conducting paper. An example of suitable paper for this purpose is Type NDA Time-Fax facsimile paper (Times Facsimile Corp., 540 W. 58 St., N. Y.). Electrodes are applied along the edges of the cell cut-out which correspond to the insulating sides of the finished cell. A suitable way of applying the electrodes is with silver conducting paint. By applying the electrodes along the sides which correspond to the insulating sides of the finished cell,

(*Continued on page 67*)

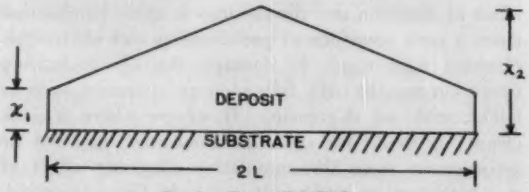

Fig. 1. Truncated Wedge.

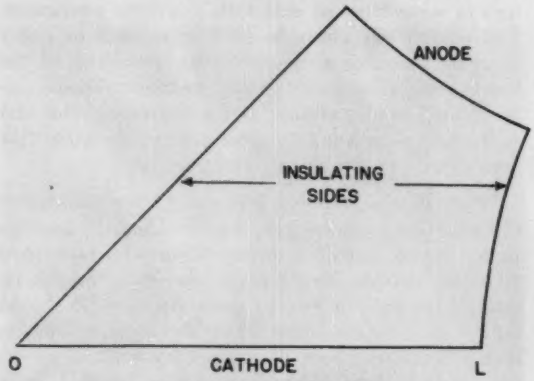

Fig. 2. Walton-Gilmont Cell. Plating thickness increases linearly from O to L.

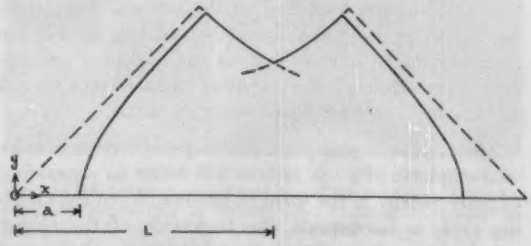

Fig. 3. Modified Cell for Plating of Truncated Wedges.

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Automatic Painting of Conduit Interiors

By Eric H. Cocks, *Plant Manager, Eclipse Air Brush Company, Newark, N. J.*

IN every industrial plant, be it small or large, and in many homes is a product with a painted finish far superior to that of your automobile. The average person has never seen this finish and very few are even aware of it. This finish is the highly important coating on the inside of thinwall and rigid electric conduit.

This inside coating, which may be a lacquer, enamel, varnish or synthetic has a multi-purpose use. It is intended to improve insulation quantities, prevent corrosion, and provide a slippery surface to make it easy for an electrician to pull batches of wires through the tubing. It must be a flexible lining in order to meet the high stresses set up when the tube is formed or bent, It must not be applied too heavily or it will remain tacky and hinder wire pulling. It must not be too light or it will fail to meet the specifications as to adequate thickness. It must have excellent adhesion qualities, for any break of the film will result in failure of the entire coating to perform its task.

Compliance with these requirements is assured by a 100 per cent inspection, after which every satisfactory length of conduit has attached to it an Underwriters Laboratory label before shipment.

Intelligent formulating by various manufacturers has made available many excellent insulating varnishes, lacquers or synthetics for this purpose.

However, to take advantage of the more modern coatings, precision application is a must. If too heavy a coating is applied it is likely that it will drain down the sides of the tube and form a puddle or ridge for the full length of the piece of conduit and this puddle will never completely dry. If insufficient coating is applied it will not pass inspection.

Fig. 1. Typical installation of conduit coating unit where pipe is brought to the machine in a batch and bundled immediately after painting.

From the foregoing it can be seen that the method of application is highly important.

Several years ago, and in some cases even today, the inside coating of conduit was applied manually by an operator inserting a hose nozzle and flowing the coating material through the pipe. It was then suspended from a fixture and left to drain. In some cases where both the outside and inside of the conduit were to be painted with an identical coating it could be placed in a basket or spool conveyor and dipped in a large tank, then hung to drain. Both of these processes required considerable manpower, floor space, excessive handling, were very inefficient and failed to apply the happy medium in coating, that is, enough to give the required coverage but no more.

Modern manufacturing of conduit calls for an integrated process, with tubing manufacture, plating, painting, and bundling all being carried out in a line operation.

Figure 1 shows a fully automatic high speed machine which is used to apply a uniform coating to the inside of either rigid or E. M. T. conduit in sizes ranging from ½" to 2", all sizes being a nominal 10 feet long. This machine operates at speeds up to 40 pieces per minute and, in addition, performs another task not usually directly associated with painting. Each piece of tubing is automatically inspected for correct length and, if it does not meet a pre-set tolerance, the process is stopped until corrected by the operator.

In the machine shown in Figure 1, the conduit is received piece by piece from the previous operation into an inclined hopper. In some cases a batch of conduit is dumped into the hopper. From here it is picked up five pieces at a time by the conduit coating conveyor and carried through the following operations:

1. Check each piece for correct length and align edges.
2. Index to next station.
3. Raise from conveyor to spray position.
4. Encase ends with cones.
5. Extensions enter tubing and spray inside on the return stroke.
6. Cones withdraw and tubing is returned to conveyor.
7. Conveyor indexes to discharge pipe to hopper.

Some of the requirements of this machine are that

such a unit be reliable, need little operator attention, be easy to adjust, and require an absolute minimum of maintenance. This last item is extremely important because, since the unit is in an integrated production line, failure of the painting or any part of the process shuts down all operations.

Of extreme importance when designing any spray painting equipment is the recognition of the likelihood that it will be neglected. For this reason, all parts must be designed so that an accumulation of paint will not stop the operation. Likewise, all mechanical parts should be designed so that they can take more than the normally accepted amount of abuse without failure.

Other requirements of a high production unit such as this include: a means of rapidly accepting different sizes of conduit, positive alignment when tubes are in the spray position, shielding of the ends to prevent off-spray on the outside and most important of all an effective nozzle which will correctly apply the more modern finishes likely to be used.

Method of Spraying

Probably the most important part of this unit is the spray nozzle, the rest of the machine being nothing more than a means for placing this nozzle in a position to effectively apply the paint.

The nozzle used is of such a design that it will apply an equally effective coating to all sizes of tubing. This is a true spray application using both fluid and air pressures. By varying these pressures the operator can apply whatever amount of fluid is required for a particular size. Once determined, the same pressures can be easily repeated when any size of tubing is rerun.

Since all spray nozzles will eventually be subjected to clogging, the nozzle is designed so that it is easily removable, thereby permitting fast cleaning by the use of suitable brushes. This clogging is sometimes accelerated due to the fact that a dirty tube may be presented to the machine or, in some cases, zinc dust or grit will remain on the inside of the tubing. This results in a serious abrasion problem, which is overcome by using hardened tool steels for the nozzles. For small sizes of tubing the extension nozzle slides alongside the lower half of it. For the two larger sizes, the nozzle is guided by a small adapter which is slipped over the end and which helps maintain the location of the nozzle in the vicinity of the center line of the tubing.

Five extension nozzles are used to spray the tubing. As trouble from any one nozzle would mean shutting down the machine, it is essential that continuous, trouble-free operation of these nozzles be maintained. Because of this, all moving parts have been eliminated from the spray gun assembly. Figure 4 shows the special manifold to which the extensions are fastened. This is a machined aluminum block with stainless steel nozzle adapters to which the inside and outside tubes are fastened. It is firmly mounted on the carriage which reciprocates, carrying the extensions inside the conduit. Fluid and air are fed to it from two lines, both of which are connected to specially designed pilot valves which turn on the air and fluid in their correct sequence. These valves require special packings that will be resistant to the fluids used.

It is essential that the valve used to control paint fluid be of such a nature that its operating force will always be sufficient to overcome the tendency of the valve spool to jam when the packings become swollen through contact with the severe solvents used in some of the newer finishing materials.

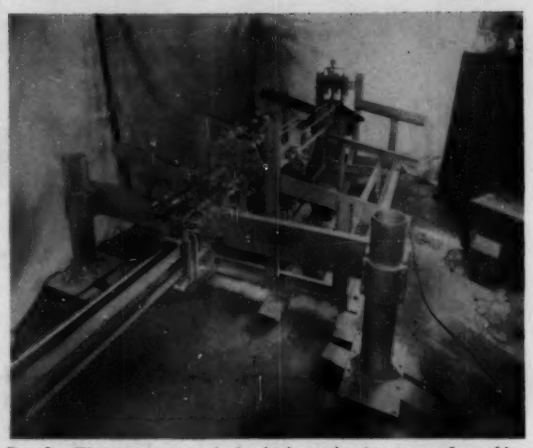

Fig. 2. The forerunner of the high production type of machine now in general use was this unit using automatic guns and three extensions. It was indexed by a Geneva Drive; it maintained a production rate of approximately twenty pieces per minute.

Design Considerations

As previously explained, the objective of the mechanism is to carry an extension gun inside the tubing so that the latter can be correctly painted. There are undoubtedly many ways in which this could be accomplished. The design of the machine discussed in this article has been developed over a period of years taking advantage of various installations of similar machines made in several plants producing conduit at high rates of speed. Suggestions from maintenance men and operators of the various plants where early installations were made proved invaluable in overcoming many problems.

Figure 2 shows an early type of interior coating machine which used a Geneva Drive for indexing and painted three tubes at a time. This was not suitable for the high production, and several years ago the entire machine was redesigned; however, retaining some of the basic principles of the older machine.

For effective coating and minimum wear on nozzle extensions, positive centering of the conduit at the spray station is essential. This machine achieves such centering by raising the conduit from the conveyor in V-blocks and clamping it against a set of positive spring loaded stops. These stops are adjustable so that the center of a 2" piece of conduit is held at the same height as the center of a ½" piece of conduit. This eliminates the necessity of changing heights of guns and making it unnecessary that the conveyor stop in an exactly alike position at each index.

Pneumatic operation had been considered for the raising and clamping of conduit but, after calculating cylinder sizes required, it was decided to use oil hydraulic operation to give positive control and fast action. This meant that a source of hydraulic power was necessary and, once this was accepted, the advantages of hydraulic power throughout were realized. The use of hydraulics has proven most satisfactory and

the wisdom of generous design tolerances has benefitted, particularly when carelessness occasionally allows cylinder rods and moving parts to become coated with paint and the unit was to continue to operate 24 hours per day.

CONVEYOR UNIT:

The conveyor consists of a double chain with each approximately 7′ apart and having 34 fingers on 4″ centers. These fingers are designed to pick-up various sizes of pipe from an inclined hopper and carry them through the required sequences. Each finger is sawed from a heavy canvas reinforced phenolic block. Such material has excellent wearing qualities and, in addition, does not mar the plating or outside coating on a previously processed tube.

The chains are carried on sprockets which are driven by a 1 H.P. hydraulic motor, reduced through a reduction unit and spur gears. This drive unit is shown in Figure 3. Two rotary cams are synchronized with the conveyor so that, for every 20″ of conveyor travel, two limit switches are tripped. One limit switch that signals the stopping of the conveyor motor, is turned on and off by a solenoid valve, triggered through the control system. An adjustable speed control valve is fitted to the solenoid for obtaining the desired operating speed.

When required, the conveyor can run continuously to pass tubing through without painting the latter.

RECIPROCATING UNIT:

The reciprocator consists of a set of hardened tracks upon which a special carriage rides. This carriage is driven by twin chains across which is fitted a ballbearing link. Reversal is effected when this link travels around the sprocket at the extreme end of the stroke and the bearing slides down a slot in the carriage. In some cases the reciprocator will be traversing a double journey of 10 feet in approximately three seconds. The reciprocator is driven by an explosion-proof geared brake motor, permitting the speed of the carriage to be slowed down for coating larger tubes. Because of the speed of travel it is essential that the reciprocator chains be kept tight at all times. This is accomplished by having them fitted with independent take-up units.

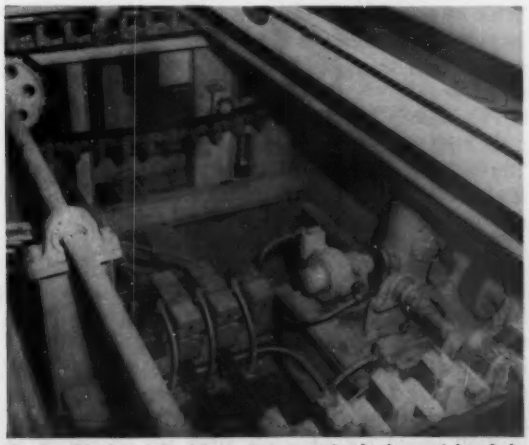

Fig. 3. The hydraulic drive unit appears in the lower right of the photograph. Immediately to its left is a hydraulic manifold which carries three solenoid control valves. It is not necessary to disturb piping if these valves are removed for maintenance.

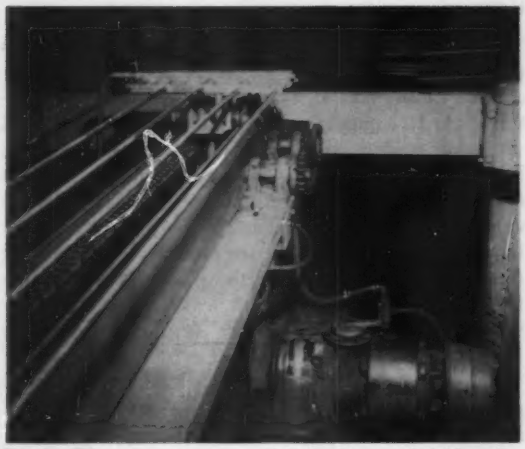

Fig. 4. This compact spray manifold feeds air and fluid to five extension nozzles. Because it has no moving parts, high speed, maintenance-free operation results.

Twin chains insure an even pull on the carriage and eliminate the necessity for replacable links when this type of reversal mechanism is used with a single chain.

EXTENSION GUIDES:

The outside of the spray extension is ½″ in diameter and the inside diameter of ½″ nominal size E.M.T. tubing is approximately ⅝″.

From this it can be seen that, in order to avoid possible damage to the extension, it is essential that it be carefully guided at its entry into the tubing. As the tube is in spraying position its end is encased by a cone as shown in Figure 5. Each extension is individually guided at its extreme end by four rollers which assist in obtaining positive, clean entry into the tube regardless of the condition of the rest of the extension. These rollers are fitted with sealed ball bearings so that their operation will not be hindered by adverse dirt conditions. The cones serve a dual purpose, as they also prevent spray from impinging on the outside of the tubing where the extension clears on its return stroke. Each size of tubing has its own set of shields. These are retained on the hydraulically operated cone clamp plate by means of spring retainers. Each cone floats on a set of individual springs and bushings so that it compensates for any misalignment of individual tubes.

CLAMPING DEVICE:

It is important that the tubes be firmly clamped in position during the spray operation, as friction from the extensions could displace them during the spray operation. Holding the tubes on a common center is essential and the method of holding them must be such that rapid changes for different sizes of tubing can easily be made. Hydraulic cylinders raise phenolic blocks which cradle the tubing and lift it from the conveyor, forcing it up against the clamps. The three center clamps are spring loaded, while the two extreme end clamps are stationary. Located behind each clamp is a limit switch which must be closed so that the next part of the cycle can take place. This insures that if a piece of tubing is misaligned the cycle cannot continue. The entire clamp bar including the limit switches is raised or lowered to suit the particular size of tubing being run by means of a handwheel clamp.

HYDRAULIC SYSTEM:

Various components of the hydraulic circuit include power source, unloading valves, solenoid valves, flow control valves, etc. The pump is a constant speed rotary vane type supplying eight gallons per minute and operating at approximately 350 lbs. per square inch. The pump feeds directly into a channeled sandwich type panel upon which are mounted sub-plate solenoid valves. This type of panel minimizes piping required but insures that any valve can be easily removed and replaced without disturbing the piping network. This reduces the possibility of oil leaks induced by improper maintenance. The valve panel can be seen in Figure 3.

The hydraulic valves used are solenoid controlled pilot operated valves. Hydraulic components controlled are the conveyor drive motor, two lift cylinders and one cone clamp cylinder.

ELECTRICAL SYSTEM:

The electrical system is composed of various standard limit switches, relays, time delay units, etc. Although the circuit may appear complicated at a first look, a study of the diagram will show that the completion of one part of the cycle must be assured and satisfied before the next part of the cycle can commence. The time delays are mainly a part of the spraying system itself which necessitates the fact that air be turned on before the fluid flows and turned off after the fluid flow has ceased.

The use of time delay relays for this purpose eliminates using additional limit switches. All relays are mounted in a JIC relay box as shown in photograph, Figure 6. This box is mounted close to the machine and the use of individual terminals for each set of component contacts provides easy installation and electrical maintenance work. Standard components insure that the plant electrician will be completely familiar with the equipment. Over 40 limit switches are used on the machine. Some of these initiate and control the operating cycle but the majority of them are part of the safety interlocks which insure that the machine will always operate in a safe condition and cannot damage either tubing or extensions. An interesting part of the electrical system is the tolerance checking apparatus. This is explained in detail further.

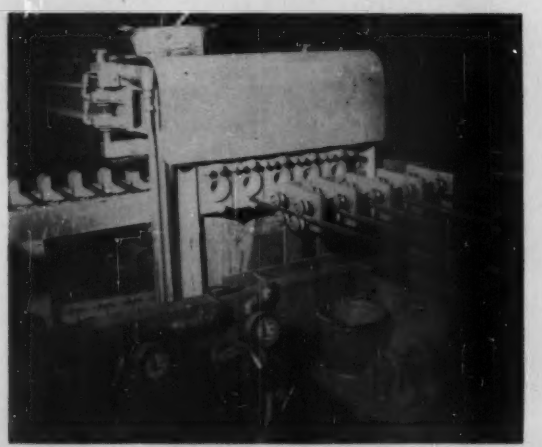

Fig. 5. The extensions pass through five cones prior to entering the tube. These cones insure that paint does not impinge on the outside of the tubing, assist in correctly positioning tubing which is slightly bent and make a good point of entry for the extension nozzles.

Fig. 6. Relay box carries the major part of the automatic control system for this machine. To the left can be seen 50-gallon pressure tanks fitted with individual agitators to insure that material stays in suspension.

OPERATOR'S CONTROL PEDESTAL:

The operator's control pedestal carries all push buttons and indicator lights used for the control and maintenance of the machine. Although there appear to be a great number of push buttons on the panel, it is only necessary for the operator to normally use a "cycle start" or "cycle stop" button once the machine has been set in operation. The remainder buttons are for setting up various conditions for maintenance and testing, such as, jogging the conveyor or reciprocator, operating hydraulic components independently, etc. Interlocks and indicator lights insure that all selector switches will be placed in their correct positions prior to commencing operation.

PAINT SYSTEM:

The paint is carried in two fifty-gallon pressure containers to permit rapid change over without loss of production when one tank becomes exhausted. Each tank is fitted with an air motor agitator which insures correct distribution of solids throughout the entire batch of paint. A twelve-gallon tank is also manifolded into the system and this is used when it is required to flush thinner through the paint lines when the unit is shut down.

The paint is conveyed to the gun manifolds through a rigid piping system which is fitted with a filter using "throw-away" cartridges. This insures that clean paint is always placed inside the tubing, minimizing the possibility of clogging the nozzles.

TOLERANCE CHECKING SYSTEM:

The usual manufacturing method is to form conduit in a continuous length and use a flying shear or flying saw to cut it into 10 foot lengths. Although every effort is made to closely control this length at the point of cut-off, there will be cases where a piece which is over or under the required length will pass by. Although this in itself would not adversely affect the operations of the painting machine, it was found that it could be checked and automatically separated immediately prior

to painting. At this point it is also momentarily at rest.

Five double acting cylinders are fitted with blocks which are automatically extended to push each one of the five pieces of conduit up against a positive stop. The cylinders are fitted with double rods and the back end has a boss which bears against two limit switches. When a piece of tubing is within tolerances one limit switch which is normally closed will remain closed. If the piece of tubing is too long the first limit switch will not be closed. If the piece of pipe is too short the second limit switch will be opened.

When this happens the machine stops automatically and a red indicator light signals the operator that a piece of tubing is out of tolerance. He then presses a button, which again extends the cylinders to check tolerance, and one of ten lights will indicate which piece of tubing it is and whether it is long or short. The operator then removes the faulty piece of tubing and replaces it with one believed to be correct.

He again presses the check tolerance button and, provided that the new piece meets the tolerance limits, the machine will continue its operation. In some cases these cylinders have been actuated hydraulically but it has been found more satisfactory to use pneumatic operation which gives quick response to slide the tube on the conveyor fingers. This checking is carried out after the reciprocator has commenced its forward stroke and is completed just prior to the reciprocator's return. Its action is signalled through limit switches operated by the travel of the carriage.

Installation

In most cases, installation of the above type of machine is generally made in the plant of a comparatively large producer of conduit.

However, it should not be assumed that high speed internal painting is economical only for large plant in-line production.

An installation where there is no conveyor either to or away from the machine and yet highly efficient and profit making conduit painting is being carried out is currently in operation. This manufacturer is well known as a supplier of tubular metal for furniture, but he is relatively new in the conduit field. Far sighted management found that they had everything required to produce conduit except a means of painting the inside. A relatively low capital investment provided this means without requiring additional labor.

Although the machine referred to above is run for only a short period each day, the conduit division is rapidly becoming of major importance to the company. An air dry lacquer is used, eliminating the necessity for expensive drying ovens. Tubing is brought to the machine by an overhead crane and dropped onto a short ramp which feeds the interior painting machine. It is bundled by hand after painting and carried by lift truck to the shipping department.

ELECTROFORMING WITH PLATING CELLS

(*Continued from page* 62)

an inverse model is set up, in which the equipotential lines correspond to the iso-current lines in the cell. Thus, it is necessary merely to measure the voltage drop along the edge of the paper corresponding to the cathode of the cell to determine the current density distribution.

Use of the method of Kinney and Festa showed that the cell of Fig. 3 would indeed provide the desired contour, namely, a truncated wedge. It should be borne in mind, however, that what is determined by the use of an inverted model is the current density distribution, and not the plating distribution. In order to translate the results obtained with the model into actual electroforming profiles, it is necessary that the current efficiency be a constant over the current density range of interest. This is normally most easily assured by use of concentrated acid-type plating solutions at relatively low current densities.

It has been shown above how the Walton-Gilmont cell can be used to electroform a truncated wedge, by suitable modification. It is evident that by suitable modifications of a and L in Fig. 3, other variations can be electroformed, provided that a linear change in plating thickness is desired in the final electroformed product. If other types of shapes must be electroformed, a different relationship between cathode and anode must be employed. Some mathematical models for doing this are given by Kasper.[4] Where the shape of the electroformed object is more complex, and does not lend itself to the type of mathematical treatment offered by Kasper, without excessive mathematical complications, the method of Kinney and Festa may be used on a trial-and-error basis to rather rapidly arrive at a suitable cell design.

In summary, it is suggested that for relatively short production runs of small parts requiring deposition of complex contours, that the use of plating cells, in conjunction with the inverse model method of Kinney and Festa, may be an attractive alternative to the use of conforming, or specially designed anodes, thieves and masks. It was shown how this approach was used to solve a problem in the plating of truncated wedges.

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Use of Automatic Machinery in the Spray Painting Field

By J. Arthur Weed

THE rapid development of automatic spray painting machinery in the past decade was due partly to the demands made on the builders of this type of equipment by private industry and the Armed Forces during the recent wars. Since that time, the spray equipment industry has developed numerous machines that save both time and material while greatly increasing the productive capacities of the companies that use them.

If one's product is of a uniform nature, it is entirely possible that it may be painted automatically, with great savings in both labor and materials.

Reciprocating Type Spray Machines

The use of reciprocating type spray machines is quite extensive in many varied industries, such as leather finishing, textiles, rugs, wallboard, steel-plastic and ceramic tile, stainless steel sheets and/or any other work of a flat nature, that requires a uniform coat of material. Some of these machines have been in use for many years and are made by most of the manufacturers of paint spraying equipment.

The horizontal reciprocating type spray machine is best suited to products that can be handled on a wire mesh, cross bar or belt conveyor. Many of these machines are of the chain drive type, although in recent years other means of power have been used, such as air cylinders, hydraulic cylinders, or other mechanical means.

With this type of machine, it is possible to use multiple spray guns to insure more uniform coverage or heavier coatings. The spray gun carriage is propelled across the surface of the work being painted and is always equi-distant to same. In this manner, the user can be assured of all parts having the same amount of material, granted of course that the spraying pressure, viscosity, etc. remain constant.

Both the speed (number of strokes) and the width of the spray pattern are adjustable on most machines. In spraying work of a narrow nature, it is necessary to speed up the number of strokes of the machine to compensate for the adjustment of width.

There is usually an automatic control valve that closes the spray gun at the end of the stroke. This not only prevents excessive build on the sides of the product, but also helps keep the air cap of the spray gun clean.

There are also reciprocating machines of the vertical type commercially available, and these may be used for the painting of flat products that are handled on an overhead, monorail conveyor. They are similar in construction to the units described above. In many cases, two of these units are mounted in staggered type spray booths when both sides of a product must be painted.

There are also reciprocating machines available, both vertical and horizontal, that will spray products of a contoured nature, such as automobile bodies, refrigerators, etc. By means of a master pattern, these units will follow the most difficult contours and, in most cases, will do a better, more uniform job than a manual operator.

In the event that it is felt that one's products lend themselves to automatic painting, the representatives of the manufacturers of this type of equipment should be called in and the problem presented to them.

If the product is of a cylindrical nature, either of small or medium size, it may be possible to paint it on a machine of the spindle type. Usually, units of this type are built using a chain, with spindles of a rotating nature spaced on centers that will accommodate the work pieces. As the work approaches the spraying station, the spindle starts revolving and an automatic spray gun (or series of guns) is actuated. The product is thereby painted with a uniform coating of material. When no product is on the spindle in front of the spray guns, the guns will not operate. Therefore, there is little material waste, and unnecessary painting of empty work holders is at a minimum.

After the product has been sprayed on this type machine, it can be conveyed through a drying or baking oven and back to the point of loading. With the use of oscillating spray gun carriages, it is also

possible to paint the inside of products on this type machine.

Machines are also available, of a round table nature, that will do an excellent job of painting when the finish used is of a fast drying nature. Usually, these machines are of the indexing type and it is possible to paint both the inside and the outside of a product at one time.

With either type of the above machines, the spraying cycle is adjustable. The user may obtain as light or heavy a coating as he desires. It is advised that those interested in such a unit discuss their requirements with an accredited representative of companies who make this type of equipment.

Large cylindrical objects, such as steel drums, can and are being painted automatically. Some of the automatic machines in use paint in excess of 500 drums per hour; in many cases, painting in two or more colors. Equipment for rotating the drum is used, with both automatic loading and unloading devices. In some cases, masks are used to prevent colors from overlapping. In most operations, however, the stripe is accomplished by adjustment of the spray guns. Color changes are frequent and often present numerous problems.

After the drum has been painted, it is usually conveyed through a baking oven. During this process, the supporting angle rails in the oven have a tendency to remove the wet paint from the chine or ends of the drum. After the baking process has been completed, the drum is usually upended and is allowed to travel on a roller conveyor to a point where it is loaded into a truck or car for shipment to its destination. At this time, it should be painted with a fast air-dry paint, on its chine only, in order to prevent rust occurring during shipment and storage. Automatic machinery is available for this operation.

In one case, a company that manufactures steel shipping containers found that the paint on the rolling hoops was being marred when they were loaded in the truck or freight car. This was solved by the application of a transparent wax coating at the time the drum was at the automatic coating machine.

Painting the heads and bottoms of steel drums also presents problems when stationary spray guns are used. Using two guns for each end usually results in getting too much paint on the center of the drum with resulting sags and runs. An oscillating arm mechanism is available that does a fair job. It is also possible to get exceptionally high quality work continually by the use of electrically timed spray guns.

With the above method of painting circular surfaces, it is possible to adequately cover the outer surfaces of a product without getting too much material in the center.

Automatic machines are also available for painting small, intricate parts that require masking. Automotive wheel discs, moldings, name plates, appliance knobs, emblems of all sorts, shapes and sizes are handled either semi-automatically or fully automatically. Some of the commercial machines in use also make provision for cleaning of masks that are used. If products of this nature are being produced, it may pay to investigate these possibilities.

Electrostatic Spraying

In recent years, electrostatic painting has come into its own. It is used with conveyors of all types which handle products of various types. Although electrostatic painting is not a "cure-all," it definitely does a remarkable job on many types of difficult-to-paint items.

The painting of irregular shapes on conveyor lines has always been a problem with multiple spray guns. However, recent developments in the electronic field have made it possible to use selective controls to actuate any one of a number of automatic spray guns, so that parts of different sizes can be painted without attendant waste of materials. By the use of photoelectric cells, products with large open areas, such as angle iron frames, can be painted with multiple gun arrangements. Painting of difficult-to-coat products can now be done automatically, where a short time ago it was considered impossible.

Airless Spraying

A new method of spray painting has been introduced in recent years which will have a pronounced effect upon the painting industry. It is called "airless' painting and involves the use of pumps that develop high fluid pressures. In some cases, there are heaters used that reduce the viscosity of the paint so that uniformity of finish is possible. Most of the pumps used are of the air-operated type, developing pressures of as high as 20 times the in-bound air pressure. When operating such a pump with 100 pounds air line pressure, 2,000 pounds fluid pressure will develop. Hydrostatic spraying has been in use for many years, but it has only been in the past decade that serious attempts have been made to apply its many advantages to the spray painting field.

The use of airless painting is somewhat limited at this time but, as a result of experimentation, it will be widely used in the years to come. With equipment of this type, exhaust requirements are cut to a minimum. In some large plants where the product to be painted is too large to move into a spray booth, it is being painted in the open plant area. Because of the toxicity and fire hazards involved, this is not a recommended practice.

With airless painting, if a different spray pattern is desired, it is necessary to change the fluid nozzle. Fluid nozzles of tungsten carbide are available which will withstand abrasives of most paints. Fluid nozzles of this type will give excellent service and, even in those cases where it may be required to replace them frequently, overall savings, both in material and operation, outweigh this disadvantage.

Summary

In summing up the case for automatic spraying, it may be stated that, if it is felt that finishing a product is a costly bottleneck, it will be advisable to investigate the possibilities of modern automatic spray painting techniques and equipment. One's efforts may prove to be highly rewarding.

New Water Soluble Baking Paint Makes Its Debut

By D. A. Marino, *Assistant Technical Editor*

Advantages of Water Base Paints

THE advances made in the field of paint and lacquer formulations in the past dozen years have been enormous. One such material, water base paint, continues to gain in popularity and consumption. This is in part because of the ease with which it may be applied as well as the quality of finish which, especially with the newer types, may be anticipated. In all cases where water is used as a thinner, a number of advantages are derived. Some of these are: little or no fire hazard, minimum loss of paint since reclaiming is a simple matter, lower cost for ventilation, and easier cleaning of spray guns, pipelines, storage tanks, floors, clothes, shoes, and gloves.

Until recently, all common types of water base (or latex) paints were of the dispersion variety. Pigment and binder particles were, for the most part, in a suspension of a water thinner (not a solvent). However, primarily due to the efforts of *Dr. H. Hönel* at Vianova Kunstharz AG, Vienna, Austria, a new type of water base paint promises to make its widespread appearance. This recently developed material actually goes into *solution* with water. Add to this its ability to be composed of either a phenolic or melamine material, both of which may be thinned indefinitely should the requirements demand, and one can easily visualize the probable interest which will surround the material for finishing purposes.

Fig. 1. Shows the difference between a water soluble binder (left) and an emulsion type of vehicle (right).

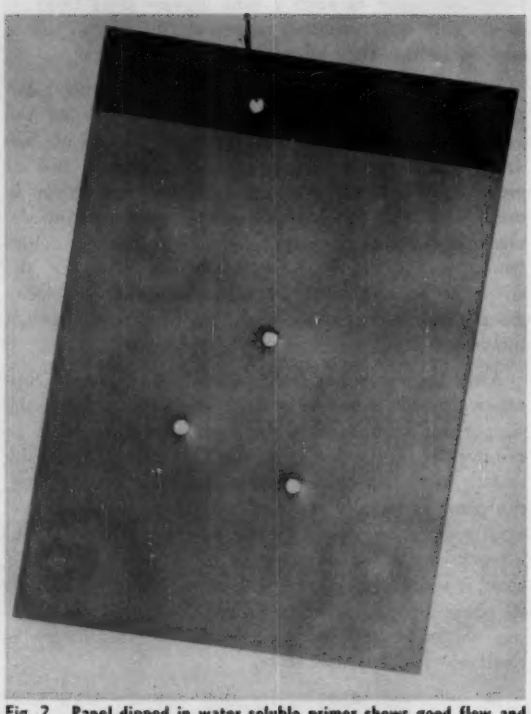

Fig. 2. Panel dipped in water soluble primer shows good flow and no sagging under the holes.

An interesting part of Dr. Hönel's paint is that even if the part to be coated is still wet from a previous cleaning operation, the material may be directly applied to its surface. This will allow the paint to be used similarly to a water-dip lacquer with all of the conveniences of the latter coating. Also, when water-wall spray booths are used, the aqueous solution of overspray paint may be reused as a solvent for new coating material, thereby minimizing overspray losses.

The material has been used both as a primer and a finish coating. As a primer it has experienced some success on ferrous metals as well as on aluminum, zinc, and cuprous alloys. A series of corrosion tests conducted on systems coated with this type finish indicate that the material favorably withstands outdoor exposure as well as simulated tropical conditions.

Two systems of water soluble paints containing phenolic binders have already been put on the market. Both are of the baking variety. The first produces a high hardness and gloss. The other is characterized by

better weathering, adhesion, impact resistance, flexibility, and corrosion resistance properties.

Other properties which this new type of water base paint appears to possess — though performance data are still too scanty and incomplete at this time — are, somewhat better heat and chemical resistance than alkyd-melamine systems. Warm trichloroethylene and lubricating oils do not readily attack the coating.

Many of the panels which were exposed on the west coast of Sweden still showed good protective qualities after 18 months.

Dr. Hönel's finishes are still limited to the darker shades; however, it appears that pastel colors are also feasible and it is expected that variety in color will soon become available.

Another feature of this type of paint, which is not common in water base coatings, is its compatibility with aluminum powder. Already, these paints containing leafing types of aluminum powders and pastes have witnessed much interest among industrial paint consumers in Europe.

Application of Water Soluble Coatings

This water soluble material has been effectively applied by regular air spraying, dipping, and roller coating. Indications are that other methods of application, such as, electrostatic, hot spraying, brushing, and airless spraying are equally effective for producing high quality finishes. Ease of application is due, at least in part, to its good flowing characteristics.

TABLE I

Baking Times and Temperatures for Phenolic Types of Water Soluble Paints, Calculated for 0.040 Inch Steel

320°F. for 1 hour
340°F. for 40 minutes
350°F. for 25 minutes
390°F. for 10 minutes
480°F. for 2 to 5 minutes

Phenolic types of water soluble paints require baking temperatures of 320°F. upwards. A typical baking schedule is shown in Table I. Melamine types of water soluble systems will permit lower baking times and temperatures than shown in Table I.

It is important that these water soluble coatings be allowed to air dry for relatively long periods of time prior to baking. The reason for this is to permit sufficient water to evaporate and therefore prevent solvent entrapment during baking. The exact time required for this air drying operation is directly proportional to the film thickness and inversely proportional to the surrounding temperature and rate of air circulation.

Fig. 3. Water soluble primer sprayed on tin plate which, after curing, was drawn 4 inches. Note the absence of cracks indicating good adhesion and distensibility.

Fig. 4. Spraying water soluble paint in a water-spray booth.

Water soluble coatings, when used as primers, are characterized by being readily sanded. The sanding operation may be performed on them either in the wet or dry condition. Finishers who are continually annoyed by increasing and erratic work loads and yet from whom production schedules demand uninterrupted primed and painted product, will welcome versatile coating materials such as these appear to be.

Storage of water soluble paints does not appear to be particularly troublesome at this time. Neither hard pigment settlement nor attack of the tin can interiors has been reported to date.

Most pigments may be used with these paints. Exceptions are, those which have an alkaline reaction, such as zinc oxide and zinc chromate.

Summary

With the widespread interest in the paint application field shown to water base (latex) paints, a new type, which differs in that it is water soluble rather than water dispersed, will probably receive a fair share of attention in the coming years. Using water as a thinner for paints reduces fire hazards, paint waste, ventilation costs, and equipment cleaning costs. This new material — which until recently was available only in Europe — along with possessing the advantages of other water base paints, exhibits other benefits, e.g., overspray in water-wall spray booths is reusable as replenishment solvent; good corrosion resistance outdoors; relatively good aluminum leafing properties; good sanding properties both in wet or dry condition; good storage properties. However, care must be used in formulating these paints (no alkaline pigments permitted) and sufficient air drying time is required prior to baking to avoid rapid water evolution with attending inferior film properties.

Water soluble paints will take their place among organic coating developments — their ultimate value will be proved by the test of time and experience.

FINISHING POINTERS

Sampling a Plating Solution

By J. B. Mohler

A REPORT from an analytical laboratory gives results for the sample that was analyzed. It is assumed that the analyses indicate the composition of the bath. This, however, is only an assumption that is valid if the sample represented the bath. Considerable care is necessary in order to obtain a "representative sample." The following actual experience indicates how very mysterious results can come about. An alkaline cleaning bath was made up and brought to operating level. A sample of the bath was taken and submitted for analysis in order to check the initial composition. The sample was analyzed and reported as 3½ oz./gal. The concentration should have been 6 oz./gal., according to the pounds of chemicals added and the volume of the tank. The result was considered and discussed by the operating department. Nevertheless chemicals sufficient for an increase of 2½ oz./gal. were added near the end of the day. The next morning a sample was taken and this time the analysis indicated 8½ oz./gal. At this point the operating department asked for an explanation. First an addition of 6 oz./gal. was made — result 3½. Next an addition of 2½ oz./gal. was made — result an increase of 5. Fortunately portions of both samples had been retained by the laboratory and repeat analyses indicated that the original results were correct. It was pointed out that the total addition was 8½ oz./gal. corresponding to the second analysis. The suggestion was made that the chemicals had not been completely dissolved when the first sample was taken, but had been dissolved when the second sample was taken. Since an excess of cleaner would not be harmful, the bath was used. Months later a sample of a freshly prepared cleaner was submitted and the results were again low. This time the laboratory asked for a fresh sample. Results for the second sample were higher but still not as high as expected. Now the laboratory submitted the evidence and asked that the bath be stirred for a prolonged period. This was done and the expected result was obtained from the third sample. This experience confirmed the well known fact that many strong alkalies, such as sodium hydroxide, sodium metasilicate and trisodium phosphate can form a slowly dissolving cake on the bottom of a tank. The formation of such a cake can be avoided by making small additions and stirring between additions. Here is a case where an alert analyst influenced plant practice. More important, the experience pointed out that the analyst can only analyze the sample he receives. The operating department contributed to the final understanding when it asked for an explanation of unexpected results. The overall experience led to a better understanding of the problems of a plater and the limitations of an analyst.

How should a sample be taken from a plating bath? In general we can say:

1. Bring bath to operating level.
2. Mix thoroughly.
3. Transfer a representative sample to a clean dry bottle. Each of these factors must be considered in order to take a proper sample.

Operating Level

Each tank should be assigned a reference level. Samples should be taken after the solution is adjusted to this level, or only when the level is measured and recorded. Usually there is no reason why the solution should not be adjusted to the reference level. Not only is this adjustment desirable for direct interpretation of analytical results, but it is also good practice to maintain an operating level as the bath is used. However, there are many exceptions to this practice. Still baths that are operated cold or warm will accumulate a sludge on the bottom of the tank that should not be disturbed during plating, to avoid rough plating. It is best to adjust these baths at the end of the day, to agitate, then to allow the baths to settle overnight. A sample of the clear solution can be taken in the morning. Or, a sample of the cloudy solution can be taken immediately and allowed to settle in the sample bottle. The analyst will prefer a clear sample but he must have a representative sample and he will filter the sample if it is necessary.

Hot alkaline baths should be sampled hot. Carbonates or other salts may crystallize out when these baths are allowed to cool. This, of course, will lead to a large error for any salt that has crystallized when an analysis is made for the particular salt. Salt will also crystallize on cooling of high concentration bright nickel baths. It is essential to know whether or not crystallization of salts is a possibility. If the salts must crystallize, let them do so in the sample bottle and not in the bath.

At times it is expected that substantial additions will be made after the analytical report is received. It is then desirable to save room to make the additions. The level should not be adjusted but should be recorded. Proper calculations of additions can be made by consideration of the recorded level as compared to the reference level.

Mixing

It is easy to specify that a bath should be thoroughly mixed prior to sampling. However, this is only a generalization that does not always apply. Uniform concentrations are automatically maintained by the convection currents of baths that are operated hot. Electrolytic action that promotes gassing, as in alkaline cleaner or a chromic acid bath, also provides mixing. Electrolytic convection in cold, high efficiency baths promotes stratification. For example, the lead concentration will increase quite readily in the bottom of a working, cold, acid lead bath. This is caused by a flow of heavy solution from the dissolving anodes. Highly concentrated cold acids, such as sulfuric or

(*Continued on page* 81)

Science for Electroplaters

41. AMINO ACIDS

By L. Serota

This is the conclusion of Part XLI. The first half appeared in our October issue.—*Ed.*

Phenolsulfonic Acid

The use of phenolsulfonic acid as an addition is indicated in the copper electrotyping, heavy rhodium plating, and acid tin solutions.

R. O. Hull and *W. Blum*, in a study of addition agents that would aid in producing a smoother, harder, deposit in electrotyping, and in shorter time than that obtained in ordinary baths, found that phenol, when introduced as phenolsulfonic acid, gave the most satisfactory results.

Phenol, in a concentration of 0.13 oz./gal. was first added directly to the solution. A soft crystalline deposit was obtained initially. After several hours of plating operation, however, the deposit became smooth, hard and fine grained. The change was attributed to the formation of phenolsulfonic acid resulting from the phenol reacting with the sulfuric acid in the acid copper bath. This view was confirmed when similar results were obtained by the addition of phenolsulfonic acid in an amount equivalent to 1 g./l. phenol. A smooth, hard deposit was obtained at once. An additional advantage gained by the use of the phenolsulfonic acid instead of phenol is that loss by volatilization from agitated solutions is reduced.

The phenolsulfonic acid was prepared by heating equal volumes of phenol and concentrated sulfuric acid at 100°C. for one hour. $C_6H_5OH + H_2SO_4 \rightarrow H_2O + C_6H_4OH{\cdot}SO_3H$ (phenolsulfonic acid). The para isomer forms at this temperature.

The recommended bath composition and operating conditions for electroplating are as follows: $CuSO_4{\cdot}5H_2O$—33 oz./gal.; H_2SO_4—10 oz./gal.; phenol added as phenolsulfonic acid 0.13 oz./gal.; temp. 35°-40°C. (95°-145°F.); current density 230-280 amp./ft.^{2} with good agitation; 90-180 with fair agitation.

In an effort to improve the quality of the deposit in heavy rhodium plating (0.0001 - 4") on a jet pump component, *H. J. Wiesner* and *H. A. Meers* report the use of phenolsulfonic acid as an addition agent in an effort to overcome the rough or flaking deposits or high stress values experienced in some tanks.

Results indicated that phenolsulfonic acid as an addition agent will brighten rhodium deposits in low concentrations, thereby overcoming the dark deposits that occurred when concentrates were diluted. The addition, it was also found, did not introduce an appreciable increase in stress.

W. L. Pinner and associates classify addition agents for bright (Watt's) nickel into two classes. One group is represented by cobalt salts and aryl sulfonic acids, especially the polysulfonic acids. Salts of cadmium and zinc, sodium formate, aldehydes, and ketones comprise the second class of addition agents. The presence of compounds of the first class in Watt's baths, it is noted, will give a bright surface on a metal previously buffed smooth. The added advantage that this class of addition agents provides is the greater quantities of the second class of addition agents that may be added to the bath, with improved action resulting from such increase.

J. W. Cuthbertson, in discussing developments in tin plating, notes that the stannous sulfate-phenolsulfonic acid bath is gaining in use in barrel plating of tin. *L. R. Westbrook* reports that suitable addition agents in a cadmium cyanide bath will improve the structure of the deposit, increase the throwing power of the bath, and increase cathode polarization. Aryl sulfonic acids, such as naphthylamine sulfonic acid ($C_{10}H_6NH_2SO_3H$), are listed as valuable addition agents.

Cresolsulfonic Acid

Tin plating from an acid tin (stannous) bath, according to *F. C. Mathers*, will not produce a satisfactory deposit unless addition agents are present. The deposit without addition agents would be masses of loose tree-like crystals. The improved results in the appearance of a deposit, when addition agents are included, is effectively shown in Fig. 178.

It is significant that a single addition agent is not sufficient. *A. W. Hothersall* and *W. M. Bradshaw* found that a combination of three classes of addition agents was necessary to provide good deposits for this type of bath. The grouping includes: (1) a sulfonated aromatic, such as cresolsulfonic acid, which acts as an anti-oxidant for the stannous sulfate as well as possessing the property of holding water insoluble compounds in suspended or colloidal form, so that the activity of such compounds as addition agents is enhanced; (2) a protective colloid, such as glue, gelatin, or lysalbic acid, which serves to produce a smoother deposit and keep the cresol or sulfonic acid in emulsion form (F. C. Mathers notes that animal glue and not vegetable glue must be used and that the glue must be soaked in water several hours, then dissolved by heating, before it is added to the bath); (3) a hydroxy compound which acts as an anti-oxidant, such as beta-naphthol ($C_{10}H_7OH$) or resorcinol, m-dihydroxybenzene [$C_6H_4(OH)_2$]. Improved covering power of the solution resulted when cresolsulfonic acid was added to baths containing beta-naphthol and gelatin as addition agents. The following formula is given by Mathers: stannous sulfate, 7 oz./gal.; sulfuric acid, 13 oz./gal.; cresolsulfonic acid, 13 oz./gal.; beta-naphthol, 0.13 oz./gal.; gelatin or glue, 0.3 oz./gal. Current density 10-40 amp./ft.^{2}, temperature 77°C.

P. C. Pine reports that the pure sulfonated cresol is not effective. In that respect Mathers does not recommend cresolsulfonate and *N. I. Lainer* indicates that smooth and dense tin deposits will result if a surface active material such as crude cresol or phenol in the unsulfonated form is added.

P. H. Margulies refers to a bright dip treatment for steel whereby the addition of a peroxygen compound to a sulfuric or phosphoric acid pickling bath will leave a light, clear surface on the exposed metal, eliminating, it is claimed, mechanical finishing operation. One of the formulas for the pickling solution listed includes: 1000 ml. water; 25 grams cresoldisulfonic acid; 100 ml. hydrogen peroxide 30%.

E. H. Lyons and *H. P. Munger* refer to the use of sulfonated cresols as one

of the common addition agents which are claimed to give smoother and brighter deposits in the acid sulfate type zinc bath.

Cresolsulfonic acid ($C_6H_3CH_3 \cdot OH \cdot SO_3H$) is obtained as a fraction in the distillation of coal and exists in three isomeric forms, namely, ortho, meta and para, which are represented by the following formulas: o-cresol ($1,2\text{-}C_6H_4CH_3OH$); m-cresol ($1,3\text{-}C_6H_4CH_3OH$); p-cresol ($1,4\text{-}C_6H_4CH_3OH$). Mathers gives the method of preparing cresolsulfonic acid by heating one part cresol with two parts concentrated sulfuric acid for two hours at 230°F. (100°C.). The cresol in the cresolsulfonic acid is not active as an addition agent; hence, unsulfonated cresol or beta-naphthol must be included in the bath. The isomers are para-cresolsulfonic acid, with the sulfonic acid group in the 2 position ($1,2,4\text{-}C_6H_3CH_3OH \cdot SO_3H$), and ortho-cresolsulfonic acid with the sulfonic acid in the 6 position ($1,2,6\text{-}C_6H_3CH_3OH \cdot SO_3H$).

Cresylic Acid

Cresylic acid is an unpurified mixture of the three isomers of cresol. It is also known as tricresol. *C. B. F. Young* refers to its use in the composition of an emulsifying solvent (soak or spray at room temperature) as one of a number of cleaning processes for ferrous metals. The mixture consists of triethanolamine, 15%; butyl carbitol, 10%; cresylic acid, 10%; kerosene or mineral spirits, 65%. *F. C. Mathers* includes cresylic acid as one of the combined addition agents with glue.

In a discussion period following a paper on epoxide resins, *R. N. Wheeler*, in answer to a question, indicated that cresylic acid is fairly effective for the removal of these coatings. A proprietary stripper, he adds, shows promising results. Cresylic acid is included by *E. H. Lyons* and *H. P. Manger* with the recommended addition agents for the zinc bath.

In an investigation relating to a suitable medium for the electrodeposition of thallium, *O. W. Brown* and *A. McGlyn* found that a smooth, coherent deposit can be obtained from a solution containing thallium perchlorate, $TlClO_4$, peptone, and cresylic acid. The most satisfactory results were obtained from a bath with the following composition: thallium perchlorate, 160 g./l.; peptone, 10 g./l.; cresylic acid, 10 cc./l.; and 10 g./l free perchloric acid ($HClO_4$). The bath was operated with a stirrer revolving at 75 to 90 rpm at a temperature of 50°-60°C. and a current density of 0.9 to 1.8 amp./dm.^{2} Peptone served as an agent for reducing polarization by preventing the formation of thallic oxides on the anode, and cresylic acid was found to be the best addition agent for reducing the spongy and crystalline appearance of the deposit. The advantages cited for thallium perchlorate include: good solubility, which permits variations in solution concentrations; stability, not affected by atmosphere; good conductivity; smooth, coherent, and virtually noncrystalline deposits are possible.

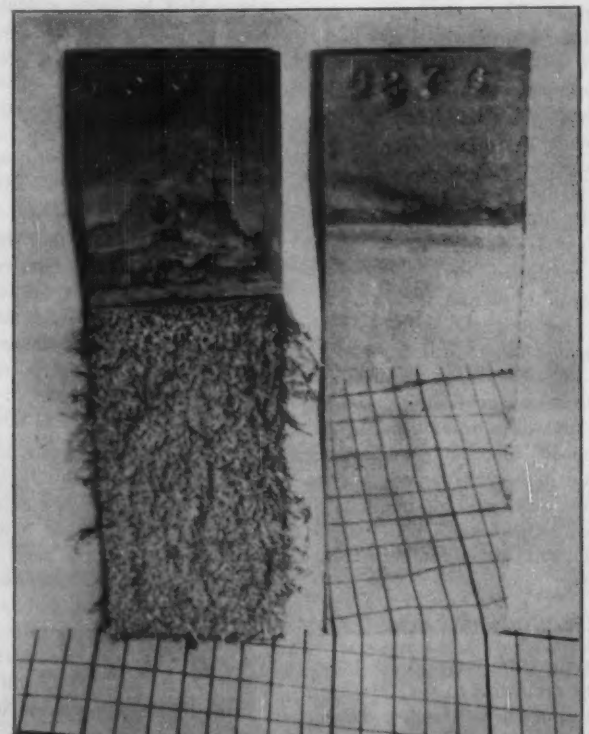

Fig. 178. Effect of addition agent in acid tin plating. Left, from bath with no addition agent; right, from bath with addition agent.

Benzoic Acid

Benzoic acid is an aromatic acid, in which the carboxyl (—COOH) group may be attached directly to the benzene ring or to the side chain. Thus, for benzoic acid, the carboxyl group is attached to the ring and the formula is C_6H_5COOH. When the carboxylic group is attached to the side chain the formula would be $C_6H_5CH_2COOH$ and the name of the acid is phenylacetic acid. One of the methods of preparing this acid is based upon the oxidation of toluene.

Benzoic acid is included in the formula for a palladium bath patented by *G. Pilet* and *C. Carry* in 1885. The composition of the bath is as follows: palladous chloride ($PdCl_2 \cdot 2H_2O$), 3.79 g./l.; disodium phosphate (Na_2HPO_4), 100 g./l.; diammonium phosphate ($(NH_4)_2HPO_4 \cdot 12H_2O$), 20 g./l.; benzoic acid (C_6H_5COOH), 2.5 g./l. The bath is operated at 50°C., 1-2 volts, and a current density of 18-28 amp./ft.^{2}

K. Schumpelt, in discussing palladium plating, notes that since about 1940 substitution of palladium amminonitrite for the palladous chloride in the above formula has improved the useful life of the bath by elimination of chloride, while maintaining a cathode efficiency of about 90 percent. The importance of palladium plating has increased steadily with the growth of electronic apparatus. Deposits for such applications range in thickness from 0.00004 to 0.0002 inch.

E. S. Sperry noted that, in depositing copper electrolytically, the addition of very small amounts of benzoic acid to a copper sulfate bath gave a bright and tough deposit. Without the addition of benzoic acid, the copper deposit he found was dark colored and granular. *N. Hall* in a survey of technical developments (1954) referred to a corrosion preventive patent in which a volatile inhibitor included vapors of benzoic acid and similar acids together with water vapor.

SHOP PROBLEMS

BARREL FINISHING — POLISHING AND BUFFING
CLEANING — ANODIZING — ELECTROPLATING
RUSTPROOFING — LACQUERING AND ENAMELING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Multiple Finishes

Question: The following is a question we would like to have answered: What is the best possible method for finishing a seamless brass tube 1" O.D. x 12" long with copper, nickel and chrome plating on the outside, with a dull black finish on the inside suitable for sterilization after plating?

G. W. L.

Answer: Blackening processes for brass are offered by a number of suppliers and a list of these will be found on page 620 of the 1958 edition of the METAL FINISHING GUIDEBOOK. These coatings should withstand sterilization.

You will have a choice of either blackening the inside first, then stopping-off to protect the interior during subsequent copper - nickel - chromium plating, or plating after stopping-off the interior, followed by blackening. Our suggestion would be to slip a close-fitting tube inside the tube to be finished and then plate. The protective tube can then be removed and the interior blackened by immersion.

Pickling 10K Gold

Question: I have a lot of 10K gold articles which have been annealed several times and have a heavy fire coat on the surface. I would appreciate your advising how to remove this fire coat. The articles are enameled on one side.

E. S.

Answer: Gold alloys are pickled in a hot solution of 1 part sulfuric acid by volume to 10 parts water. After pickling off the scale, the parts can be brightened by treating with reverse current at 12 volts in a hot solution of 8 oz./gal. potassium cyanide.

It is suggested that you test this method on an enameled piece before using it in production, in order to determine whether the enamel will withstand the solutions.

Exhausting Spray Booths

Question: I would like to inquire as to the general industrial requirement of the rate of flow of air in the area of a spray booth. Please advise what is the accepted industrial standard of air velocity for spray booths and cite references. If you have any recent literature on the subject which specifies a specific value or values, I would appreciate receiving a copy.

H. J. W.

Answer: Standards for air velocity for ventilation are set by state agencies. You can obtain details from the Department of Labor, Division of Industrial Hygiene and Safety Standards.

An average of 100 fpm is usually considered the minimum capture velocity and, in the case of explosive and flammable materials, the figure of 150 is employed to allow a factor of safety and for dilution below the lower explosive limit (L.E.L.) of the most dangerous material present.

Design and operation of exhaust systems are detailed in publications available from the American Standards Association in New York.

Wet-wall versus Dry-wall Spray Booth

Question: We are engaged in job shop paint spraying and are now considering installing new spray booths. We spray lacquers, enamels, and primers and have been told that for our purposes a wet-wall booth is superior to a dry-wall booth. Do you feel this is the case?

J. T.

Answer: Wet-wall booths have steadily increased in popularity in the organic field. This is primarily because with wet-wall booths less paint is exhausted into the outside plant atmosphere, fire hazards are reduced (especially where lacquers containing oxidizing resins and enamels are sprayed in the same booth), and it is unnecessary to coat, then strip, booth walls as paint material accumulates.

Initial costs for wet-wall booths are, however, higher and these booths require various, often cumbersome, maintenance procedures to assure extended trouble-free operation. Unless one considers all the pertinent factors involved, the correct choice of which booth should be used for most efficient operation is difficult, since both have their particular ranges of usefulness.

Deposition of Brazing Alloys

Question: We have a job where we electroplate copper on the parts and then furnace braze them. The high brazing temperature is objectionable. Can you tell me if there is any process by which a lower melting point brazing alloy can be plated? For example, is it possible to plate an alloy of 52% copper, 25% silver and 23% zinc, from a single bath?

Any suggestions regarding this problem will be greatly appreciated.

C. H. B.

Answer: Our files show no process for depositing an alloy of copper and zinc with more than a trace of silver. However, if copper-zinc alloys would be suitable as brazing materials, these can be deposited over a wide range of compositions. The standard brass solution will produce a range of compositions. The standard brass solution will produce a deposit of from 65-80% copper and the so-called white brass solutions from 25-30% copper. These solutions can be modified by trial and error to produce deposits with copper contents between the ranges given above. Copper-tin alloy deposits can also be produced with varying ratios.

Spotting Out

Question: In the mass production of door knobs, escutcheons, and other

decorative trim parts for our locks we are faced with the problem of producing a durable lacquered finish on brass and bronze. One of our most persistent problems is the development of dark blemishes on these lacquered finishes. These blemishes, ranging from pin point spots to dime size blotches, appear after the baking lacquer has been applied.

Perhaps in your more specialized experience with organic coatings and metal finishing you have encountered similar problems and can suggest where our trouble might be or who we should contact for help on this problem. We will greatly appreciate any suggestions or references you can provide us.

R. H. M.

Answer: The dark discoloration on the lacquered parts would probably be spotting out or crystal spotting. The latter has a dendritic appearance, under magnification, similar to pine tree needles, while the former shows some white salts around a small hole in the metal, in most cases, from which the brown extends.

Spotting out is prevalent in warm, humid weather, and is due to solution in the pores of the metal. The condition can be minimized by a 15 minute bake at about 225° F. prior to lacquering, in order to dry out the pores, or by the use of ultrasonics with clean water or alcohol.

Crystal spotting is usually due to particles of sulfide on the surface, the source of which is often the dust produced when "oxidized" parts are highlighted. A good wiping prior to lacquering will help.

Blistering Around Fine Threaded Holes

Question: I am enclosing one sample part — base metal is aluminum alloy 20-24 T4. Parts are cleaned in caustic soda, 4 to 6 oz./gal., 180° F. and de-oxidized in 60% nitric acid. This is followed by a 25 second immersion time in a zincate bath, followed by one minute stripping in 60% nitric acid and another 25 second immersion in zincate bath, actively rinsed and immediately copper flashed in a caustic free copper bath, 1 minute, 6 volts direct. This is followed by a 24 K gold wash, 8 seconds, 6 volts, 150° F. Adhesion appears to be good except on very fine threaded holes.

R. A. C.

Answer: The blisters showing around the threaded holes on the sample forwarded may be due to oil or one of the pretreatment solutions trapped in the holes. Tiny holes of this type are a difficult problem to handle. If possible, the holes should be drilled and tapped after plating, rather than before, in order to avoid trapping dirt or solution.

If this is not possible, ultrasonic cleaning and rinsing may be effective, but this will be a gamble.

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Patents

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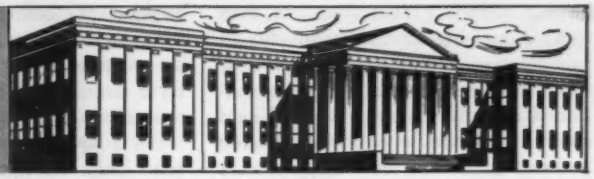


Electrostatic Coating Process

U. S. Patent 2,827,394. *March* 18, 1958. *F. A. Sherman.*

The method of electrostatically coating articles with a liquid coating material which comprises successively moving vertically extending filaments into opposed relationship to articles having surfaces to be coated, advancing the articles relative to the filaments to bring successive areas of the article surfaces into registration with adjacent filaments, applying liquid coating material to the filaments during movement of the filaments to positions in opposed relationship to the articles, and establishing an electrostatic field between the respective filaments and registering article to be coated of sufficient potential to disseminate the coating material on the filaments and propel the particles of the coating material to the articles.

Paint Remover

U. S. Patent 2,827,439. *March* 18, 1958. *B. Helper.*

A composition for removing paint and consisting of the following ingredients in approximately the percentages specified: caustic soda 21.80%, ethylene glycol monobutyl ether 5.51%, methylene chloride 8.13%, sodium oxalate 2.06%, sodium keryl benzene sulphonate 1.28%, methyl cellulose 0.79%, straw oil 3.12%, cornstarch 1.28% and the balance water.

Electroless Iron Deposition

U. S. Patent 2,827,398. *March* 18, 1958. *P. H. Eisenberg, assignor to Sylvania Electric Products, Inc.*

The method for electrolessly depositing an iron coating on the surface of a metallic substrate, which comprises the steps of inserting said substrate into an electroless plating bath consisting essentially of an aqueous solution containing at least one ferrous salt having a concentration of approximately 30 grams per liter, a hypophosphite salt having a concentration of approximately 10 grams per liter, and at least one buffering and sequestering agent soluble in the bath, said agent being selected from at least one element of the group consisting of oxalic acid and its salts, citric acid and its salts and Rochelle salts, the concentration of said agent falling within the approximate range 25-100 grams per liter; and maintaining the pH of said bath in the basic region until the electroless deposition is carried to completion.

Electroless Deposition of Iron Alloys

U. S. Patent 2,827,399. *March* 18, 1958. *P. H. Eisenberg, assignor to Sylvania Electric Products, Inc.*

The method for electrolessly depositing an iron alloy on the surface of a metallic substrate, which comprises the steps of inserting said substrate into an electroless plating bath consisting of an aqueous solution containing a ferrous salt together with a salt of at least one metal from the group composed of cobalt, nickel and chromium, the positive metal ions being present in their lowest ionic valence state, said ferrous salt and said one metal salt having a combined concentration falling within the approximate range 40-60 grams per liter, the ferrous salt concentration being at least 50% by weight of said combined concentration; a hypophosphite salt having an approximate concentration of about 10 grams per liter; and at least one buffering, sequestering and reducing agent soluble in the bath, said agent being selected from at least one element of the group consisting of oxalic acid and its salts, citric acid and its salts, and Rochelle salts, the concentration of said agent falling within the approximate range 50-160 grams per liter; and maintaining the pH of said bath in the basic region until the electroless deposition is carried to completion.

Electroless Deposition of Vanadium Alloys

U. S. Patent 2,827,400. *March* 18, 1958. *P. H. Eisenberg and D. O. Raleigh, assignors to Sylvania Electric Products, Inc.*

An electroless plating bath containing in aqueous acid solution, a vanadium salt; a salt of at least one metal selected from the group consisting of nickel, cobalt and chromium, the positive ions of the vanadium and metal salts being in their lowest ionic valence state, the combined concentration of the vanadium salt and said one metal salt falling within the approximate range 35-38 grams per liter; a hypophosphite salt having a concentration of about 10 grams per liter; a buffering agent; and at least one reducing and complexing agent which maintains said positive ions in their lowest valence states and also forms at least one complex with said ions which is readily reducible to an alloy composed of vanadium and said selected metal when an electroless deposition operation is intended, said agent being selected from the group consisting of oxalic acid and its salts, said agent having a concentration of about 50 grams per liter.

Method of Pickling Titanium and Titanium Alloys

U. S. Patent 2,827,402. *March* 18, 1958. *G. F. Albers and W. B. Stephenson, Jr., assignors to General Electric Co.*

A method of the character described for removing scale from a titanium or titanium alloy article comprising the steps of immersing the article in an aqueous solution consisting of sulfuric acid and calcium fluoride until the scale is converted to a gray film thereafter immersing the article in a mineral acid solution to remove the gray film.

Protective Oxide on Iron

U. S. Patent 2,827,425. *March* 18, 1958. *R. L. McClasson and F. J. Radd, assignors to Continental Oil Co.*

The process of forming a protective coating on an iron object which comprises immersing said iron object as one electrode in an aqueous solution of an electrolyte the pH of which is not less than four and wherein the cations of said electrolyte are selected from groups 1 and 2 of the periodic table

having specific gravities of less than four, immersing another conductor in said solution, connecting to a source of direct current such that said first-mentioned electrode is negative and said second electrode is positive, allowing a direct current to flow between said electrodes for a period of time until the surface of said first-mentioned electrode is activated by electrically released hydrogen, reversing the polarity of said electrodes until a layer composed of ferrous and ferric hydroxides is formed on said iron object and cyclically repeating said process whereby said iron object is first made cathode and then anode at least once and then converting the said layer of mixed hydroxides to ferric oxide, wherein the cathode-anode time ratio in respect to the iron object is about 3:2.

Plating Rack

U. S. Patent 2,827,430. *March* 18, 1958. *V. R. McGibbon, A. G. Taylor, G. L. Bernard and D. L. Freyberger, assignors to Lukens Steel Co.*

An electroplating rack comprising a pair of generally vertically arranged substantially parallel sides.

Paint Brush Cleaner

U. S. Patent 2,827,647. *March* 25, 1958. *W. V. Speer.*

A device for cleaning paint brushes, rollers and the like in a container of solvent.

Paint Remover and Brush Flattener

U. S. Patent 2,827,648. *March* 25, 1958. *H. F. Geisz.*

A device for removing excess paint from a brush dipped into a container of paint.

Paint Applicator

U. S. Patent 2,827,649. *March* 25, 1958. *E. W. Perry.*

A paint applicator comprising a handle, an elongated hollow cylindrical fluid reservoir mounted on said handle, transversely spaced end plates mounted on said reservoir, and an elongated cylindrical dispensing roller rotatably mounted between said end plates.

Rejuvenating Aluminum Pickles

U. S. Patent 2,828,193. *March* 25, 1958. *K. W. Newman, assignor to Turco Products, Inc.*

In a method of treating aluminum objects having a surface layer of metal compounds thereon to remove said compounds, wherein said compounds are removed by contacting said surface layer with an aqueous acidic solution containing fluoride ions, said solution being adapted to react with and dissolve said layer without appreciably corroding the aluminum objects; the improvement of revivifying said solution, after treatment and removal of said aluminum objects from the bath, by increasing the free fluoride concentration thereof above that existing during the metal compound dissolving procedure to a concentration corrosive to aluminum objects by adding to said solution a free fluoride ion yielding compound in an amount substantially equal to the amount of said compound stoichiometrically equivalent to the dissolved metal ions present in the solution, to precipitate substantially all the dissolved metal ions from said solution in combination with the additional fluoride ions.

Porcelain Enameling

U. S. Patent 2,828,218. *March* 25, 1958. *H. M. Zimmerman, assignor to The Fletcher Enamel Co.*

A process for preparing the surface of a metallic basis material for coating with a porcelain enamel cover coat comprising: applying to the metallic surface a coating layer of a flint-feldspar-borax containing type of enameling composition to a weight, per side, of from $\frac{1}{8}$ to $\frac{3}{8}$ ounce per square foot dry weight; and firing the metallic basis material for from 3 minutes to 8 minutes at a temperature of from 1300°F. to 1700°F. to form a matlike ground coat.

Electroless Deposition of Vanadium Alloys

U. S. Patent 2,827,399. *March* 18, 1958. *P. H. Eisenberg, assignor to Sylvania Electric Products, Inc.*

An electroless plating bath containing in aqueous alkaline solution, a vanadium salt; a salt of at least one metal selected from the group consisting of iron, nickel, cobalt and chromium, the positive ions of the vanadium and metal salts being in their lowest ionic valence state, the combined concentration of said vanadium salt and said one metal salt falling within the approximate range 50-53 grams per liter; a hypophosphite salt having a concentration falling within the approximate range 10-20 grams per liter; a buffering agent; and at least one reducing and complexing agent which maintains said positive ions in their lowest valence states and also forms at least one complex with said ions which is readily reducible to an alloy composed of vanadium and said selected metal when an electroless deposition operation is intended, said agent being selected from the group consisting of oxalic acid and its salts, said agent having a concentration falling within the approximate range 9-20 grams per liter.

Ultrasonic Cleaning

U. S. Patent 2,828,231. *March* 25, 1958. *G. E. Henry, assignor to General Electric Co.*

A method of cleansing an object, which comprises immersing the object in a liquid, transmitting ultrasonic compressional waves through said liquid to said object in such a manner that the surface of said liquid is agitated thereby, repeatedly moving said object in and out of said liquid through the agitated free surface thereof, maintaining dissolved gas in said liquid, and controlling the temperature of said liquid to tend to prevent driving off of gas therefrom.

Plating Machine

U. S. Patent 2,828,255-6, *March* 25, 1958. *E. Gempe, assignor to Wurttembergische Metallwarenfabrik.*

Apparatus for producing locally thickened galvanic deposits on at least one predetermined surface part of articles inserted in said apparatus as cathodes.

Spray Coating Means

U. S. Patent 2,829,006. *April* 1, 1958. *I. O. Johansson, assignor to Binks Mfg. Co.*

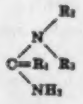
In a spray device for spraying coating material intimately commingled with a liquid curing agent, the combination with a primary spray gun for dispersing the coating material provided with a longitudinally disposed aperture, and valve stem means for normally closing said aperture, of means associated with said stem for imparting reciprocatory movement of said stem relative to said aperture, said means including means for controlling admission of pressure fluid and coating material to said spray gun, a plurality of orifices disposed in a plane intersecting said aperture with their openings in parallel alignment with the axis of said aperture, and a plurality of jet ports

coplanar with said aperture and said orifices, and having their axes arranged to substantially radially converge and intersect a line extending axially of said aperture, and a secondary spray gun associated with said primary spray gun and serving to emit a curing agent into the path of coating material dispersed from said primary spray gun and having the aperture of its nozzle positioned with its axis substantially at right angles to the axis of the aperture of said primary spray gun.

Electrodeposition of Bright Zinc, Copper, or Nickel

U. S. Patent 2,828,252. *March* 25, 1958. *J. Fischer, assignor to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler.*

A bright metal electroplating bath for electrodepositing a metal selected from the group consisting of zinc, copper and nickel comprising an aqueous electrolyte of the metal to be deposited which contains as a brightener at least 0.5 gram per liter of a condensation product of an unsaturated aldehyde selected from the group consisting of acrolein and its alpha substitution products, and a urea of the general formula.



wherein R_1 is selected from the group consisting of oxygen, sulfur and imin radicals and R_2 and R_3 are each selected from the group consisting of hydrogen, alkyl, alkenyl, aryl, aralkyl and acyl groups of saturated and unsaturated acids.

Liquid Buffing Composition

U. S. Patent 2,829,035. *April* 1, 1958. *S. L. Doughty and E. T. Candee, assignors to The Lea Mfg. Co.*

A liquid buffing composition comprising an aqueous emulsion of a mixture consisting essentially of 20% to 45% by weight of a fatty acid grease having intimately dispersed therein from 50% to 75% by weight of a finely-divided abrasive and from 2½% to 8% by weight of a non-ionic surface-active emulsifying agent selected from the group consisting of condensation products of alkylene oxides and fatty acids containing 12 to 18 carbon atoms, condensation products of alkylene oxides and fatty alcohols containing 12 to 18 carbon atoms, condensation products of alkylene oxides and rosin acids, condensation products of alkylene oxides and partial esters of hexitol anhydrides and fatty acids containing 12 to 18 carbon atoms, condensation products of alkylene oxides and amide derivatives of hydrogenated tallow fatty acids, condensation products of alkylene oxides and alkyl phenols, condensation products of alkylolamines and fatty acids containing 12 to 18 carbon atoms, condensation products of polyoxypropylene and ethylene oxide, glycol esters of fatty acids containing 12 to 18 carbon atoms, partial esters of hexitol anhydrides and fatty acids containing 12 to 18 carbon atoms, glycol esters of rosin acids, and partial esters of hexitol anhydrides and rosin acids, there being from 0.2% to 0.75% of bentonite clay by weight of said mixture dispersed in said emulsion, said liquid composition having an aqueous continuous phase in which particles of bentonite and emulsified particles of grease having the abrasive particles substantially completely enveloped therein are separately dispersed.

Electroless Chromium Plating

U. S. Patent 2,829,059. *April* 1, 1958. *P. H. Eisenberg and D. O. Raleigh, assignors to Sylvania Electric Products, Inc.*

An electroless chromium plating solution composed of the following in aqueous solution: a hypophosphite salt having a concentration of about 10 grams per liter; a buffering agent; at least one chromic salt having a concentration of about 17 grams per liter; and a chromium deposition rate controlling agent soluble in the solution and characterized by the ability to reduce chromic ions to chromous ions and to form a readily reducible complex with said chromous ions, said agent being selected from the group consisting of oxalic acid and its alkali salts, said agent having a concentration falling within the approximate range 4.5-9.0 grams per liter.

Galvanizing Flux

U. S. Patent 2,829,077. *April* 1, 1958. *D. B. Speed, assignor to E. I. du Pont de Nemours and Co.*

A galvanizing flux consisting essentially of a fluxing material selected from the group consisting of ammonium chloride, zinc chloride, and zinc ammonium chloride and the condensation product of oleyl alcohol with about 10 mols of ethylene oxide, flux containing about 0.02 to 0.5 gram of condensation product per 100 grams of fluxing material.

Plating on Titanium

U. S. Patent 2,829,091. *April* 1, 1958. *L. Missel, assignor to Menasco Mfg. Co.*

A process for treating the surfaces of articles of titanium and titanium base alloys, including the steps of immersing said articles in a bath consisting essentially of an aqueous solution of 0.5% to about 20% by weight of hydrofluoric acid, and from about 15% by weight to the saturation point of a chromium compound selected from the group consisting of chromic acid and its salts, maintaining the temperature of said bath at about 180°F. to the boiling point for 10-20 minutes, removing said articles and rinsing the same, and electroplating said articles in a plating solution.

Measuring Stress in Deposits

U. S. Patent 2,829,517. *April* 8, 1958. *J. B. Kushner.*

The method of measuring the force produced by coating a planar disc-shaped element, comprising the steps of clamping the periphery of the element in a holder over one end of a cavity formed therein, filling the cavity with an indicating liquid which is continuous with a vein of said indicating liquid, producing a coating of substantially uniform thickness on all of or a predetermined portion of an unclamped zone of the surface of the element external of the cavity, the coating producing a force which transversely deforms the element, to change the pressure on the indicating liquid and consequently the length of the vein of liquid and measuring the change of length of the vein as a measure of the force produced by the coating.

Sulfide Conversion Coating

U. S. Patent 2,829,995. *April* 8, 1958. *E. H. Newton and J. L. Sienczyk, assignors to Arthur D. Little, Inc.*

Process for depositing a sulfide coating on the surface of ferrous alloys, comprising the steps of activating said surface in an aqueous solution of a ferric salt of a strong mineral acid, rinsing the activated surface in an acid bath having a pH ranging from about 2 to 3, and immersing said activated surface in a sulfiding bath containing solubilized polysulfides.

ABSTRACTS

Pickling Brass Strip in Dilute Sulfuric Acid

M. Stammler and F. Neumueller; *Metall*, 11, No. 11, 945.

With normal commercial brasses, where a highly polished surface is not required, the removal of scale and oxide can be conducted by pickling with dilute sulfuric acid. The acid concentration, in general, is 10 - 14%. The actual effect of this pickle is, primarily, that the surface oxides are rapidly dissolved or loosened. This offers the possibility of easily removing these oxides by mechanical brushing and rinsing. The basis metal is attacked only very little. A further point of great practical importance is that no noxious vapors or fumes are given off during pickling, which reduces the installation costs considerably, as no exhaust system need be provided.

In pre-pickling after hot working, only brass strip with an oxidized surface is passed into the bath. Careful analytical tests conducted on the bath demonstrated that no de-zincing of the brass surface appears to take place. Practically no attack on the brass takes place, as the pickling time (about 3 - 4 minutes) is much too short. The pickling liquor can be regenerated many times, by the addition of sulfuric acid.

The conditions are somewhat different in the case of the finish pickle. The material now has a dominant metallic surface condition, as a result of the pre-pickle and of cold working. A 12% sulfuric acid bath is also used here; after a short time, the acid content sinks to 3 - 4%, and it is not possible to hold the concentration constant by further additions of acid. Thus, practically, a regeneration of the bath by this means is not possible.

The ratio of copper to zinc in the acid is found to be 1:100. In addition, a thick sediment of zinc sulfate is present in the tank. This zinc sulfate sediment exerts a buffering action which is so strong that the acid concentration cannot be increased to any considerable extent, even with the addition of concentrated sulfuric acid. The greater amount of the copper which passes into solution, precipitates out again on the brass strip, in the form of a loose copper sponge.

As the acid can act directly on the metal in this bath, a potential difference of 80 - 90 mv. is formed between the metal surface and the bath. The potential difference which is set up between the oxide coating on brass and the acid amounts to only 10 - 13 mv. When the pickling solution becomes saturated with zinc sulfate, it crystallizes out and makes possible the further solution of metallic zinc from the brass. A de-zincing of the brass surface thus occurs. Further investigations have shown that the use of a 2% sulfuric acid as the pickling fluid maintains the pickling action for considerably longer and reduces the acid consumption appreciably. The explanation for this is the considerably reduced potential difference between the acid and the metal.

Hard Chromium Plating of Machine Parts

P. Morriset: *Metaux*, 32, No. 381, 208.

By means of examples, the author presents a survey of the progress which has been achieved in France in the application of modern hard chromium plating techniques, for the raising of the wear resistance of machine parts. There is variously discussed, the hard chromium plating of thread profiles and internal screw threads, electropolished surfaces, piston rings, internal combustion engine and compressor cylinders, brake drums and discs, textile machine parts, boring and milling machine tools for the working of light metal alloys, buffer rods, press heads, coatings resistant to sea water, water turbine parts as well as the application in the cinema and music industries.

Etching of Stainless Steels

By O. P. Kraemer: *Metallwarenind. und Galvanotechnik*, 48, No. 4, 150.

Etching is frequently used on stainless steel products for the purpose of marking and decoration. If it is a question of a light etching for a trade mark or direction, for example, then an etch base is not necessary and contact etching is employed. The etch solution is applied on the carefully cleaned surface with a rubber stamp. Hard rubber should be used. A cloth is stretched over a glass plate and uniformly moistened with the etching solution. The stamp is then uniformly loaded by pressing on the cloth and then on the part to be etched. It should dwell for a short time without movement and is removed. The etched part is then cleaned with a damp cloth, dried, and, finally, lightly greased. Usable etching solutions for the purpose are a cold, saturated copper-ammonium chloride solution to which 1 cc./l. of ammonia is added and the solution filtered.

A suitable etching solution for chromium steels is:

Selenous acid	100 g.
Crystalline copper sulfate	50 g.
Nitric acid	75 cc.
Water	1,000 cc.

The etching process is of longer duration with deep etching. The parts which it is not intended to etch must, accordingly, be blocked off. The metal surface should be completely grease-free. The simplest medium is an asphalt coating. To prepare this, 500 g. asphalt are dissolved in 1,000 g. turpentine. A harder etching ground is obtained if 200 g. asphalt, 200 g. colophony and 200 g. beeswax are melted together and then dissolved in 122 g. turpentine. For electro-etching, a suitable etching ground is 400 g. wax, 400 g. asphalt and 100 g. pitch.

For deep etching chrome steels, there can be used a solution of 800 cc. 40° Bé iron chloride solution and 200 cc. of hydrochloric acid. A saturated copper sulfate solution is used for weaker etching, acidified with hydrochloric acid. Etching can also be done with 3% sulfuric acid at 90° C. Etching at room temperature is possible with 25 - 40% sulfuric acid. Deep etching is possible in a short time electrolytically. The part to be etched is made the anode. A 10% sulfuric-oxalic acid solution or chromic acid solution is used as the electrolyte.

Hardness and Wear Resistance of Plated Silver Coatings

By R. Weiner and E. Brosch: *Metalloberflaeche*, 10, No. 6, 164.

This work served to confirm that impression hardness represents no direct measurement criterion for wear resistance. No considerable differences exist between normal, plated silver, polished silver, and bright plated silver of varying origin. In particular, mechanically steel burnished silver does not fall outside the field of other silver plating but, as regards wear resistance, it should possess a slight superiority to

plated bright silver and silver plating from slow working baths without subsequent burnishing.

The following silver plated coatings were investigated:

1. Silver from the standard potassium cyanide bath, at 0.3 amp./sq.dm., subsequently polished on a cloth wheel.
2. Silver from the same bath and under the same conditions, subsequently burnished with the steel by hand.
3. A Weiner bright silver bath agitated, operating at 2.5 amp./sq.dm., no after-polishing treatment.
4. A Raub bright silver bath operating at 1 amp./sq.dm., agitated, no after-polishing treatment.

The silver plated coatings were applied on polished brass sheet and the micro-Vickers hardness and scratch hardness were determined. The deposits were also applied on brass cylinders 12 mm. diameter and 30 mm. long, weighing 27 g. These cylinders, after plating, were agitated in a rotating drum (50 mm. diameter, 80 mm. long), each wear test being made with the same amount of fresh #50 grit emery powder. The loss in weight was ascertained after a definite time interval.

For further testing and in the same manner, coffee spoons of Alpaka metal were silver plated and likewise tumbled with emery powder of the same grain size. Tumbling of the test spoons was conducted in a considerably large drum 130 mm. in diameter and 200 mm. in length since, with the smaller drum, the surface of the spoons is not scoured but would only be lubricated and no kind of usable wear figures could be obtained.

The weight of the test spoon was also 27 g. The surface is about four times greater than brass test cylinders of the same weight, so that the specific scouring effect in this case is considerably smaller than in the first case. The loss in weights per sq. cm. of surface during the same period, accordingly, are smaller with the spoons than with the rolls. The hardness values which were obtained are shown in the following table.

	Average Hardness, 20 micron coating
Slow bath: Wheel polished	116
Slow bath: Steel polished	110
Bright silver, Weiner	76
Bright silver, Raub	185

Brass Pickling Baths

Metallwarenind. und Galvanotechnik, 47, No. 11, 509.

For the preparation of the pre-pickling bath, 1 liter of 66° Bé sulfuric acid is added carefully to 9 liters of water; higher acid concentrations than this should not be used. The bath can be operated at temperatures between 20° and 80°C. The scale and oxide coatings are loosened, and the surface of the brass, which is dark before treatment, after the pickling becomes brown to brown-red. This film can then easily be removed by scratch-brushing with wire brushes. The pickling treatment may require up to several hours according to the thickness of the oxide coating. The advantage of the pre-pickle bath is that the subsequent bright dip baths require shorter periods, which prolongs the life of these expensive baths.

The pre-bright dip bath provides a metallic clean surface with a short immersion. The ware should be moved in the bath during the treatment so that uniform attack is obtained and this shortens the immersion time. The effect of this bath is also accelerated if the ware is immersed, removed from the bath and then re-immersed. The temperature of the bath should not be above 40°C., to avoid over-pickling. Over-pickled ware cannot be bright dipped. The pre-bright dip bath is made up of 1 liter of nitric acid with 10 cc. of hydrochloric acid.

The bright dip proper is made up of a mixture of nitric and sulfuric acid with small additions of sodium chloride. An example of a bright dip composition is: 1 liter nitric acid; 1 liter sulfuric acid; 20 cc. hydrochloric acid. The bath should be held at temperatures between 20° and 35°C. Special effects in the color tone achieved, from bright yellow to reddish, are obtained by changing the mixture ratio. The solution speed of the copper becomes greater with increasing nitric acid content. More zinc is dissolved with a higher hydrochloric acid content. Spotting troubles can occur with too low a nitric acid content. Only a few seconds treatment should be given, both in the bright dip and mat dip baths. A pre-dip bath is necessary also with the mat dip.

A mat dip bath for brass which gives good results has the following composition: 2.1 liters nitric acid; 1.1 liters sulfuric acid; 20 g. sodium chloride; 10 g. zinc sulfate dissolved in 50 cc. water. The dip time is dependent on the effect required. The longer the bath is allowed to act, the duller is the matting effect obtained.

The ware should be cleaned before all the above dips. Careful thorough rinsing is necessary after these dips. Rinsing should be given also between the pre-dips and bright dips. If the ware is not to be further handled, it should be finally hot rinsed, and dried in sawdust. A fine grained mat is produced with chromate baths: 100 g./l. potassium dichromate and 50 - 100 cc. sulfuric acid.

FINISHING POINTERS

(*Continued from page* 72)

phosphoric, will absorb water from the air and cause a diluted layer to form near the surface. A bath should be agitated prior to sampling if water is added to the bath or if there is any possibility that the solution will not be uniform.

Sampling

A representative sample should be taken, which is one that has the same composition as the bath from which it is taken. If a solution is thoroughly mixed so that it is uniform throughout, a dip sample will be representative. However, we have seen that many local changes can take place in a solution so that it is not always uniform. Large baths, such as those in long tanks in an automatic plating machine, are difficult to mix, particularly where disturbance of a sludge may lead to trouble. If there is any possibility of non-uniformity, a number of small samples are taken and combined to obtain a sample representative of the average composition of the bath. These samples are taken with a glass tube in order to get top to bottom representation as well as points along the length of the tank. The tube is placed in the solution, the thumb held over the end and the sample is withdrawn and caught just after the bottom of the tube is raised above the surface. Although this procedure will correct for variations, it should not be considered reliable for large variations. If large variations exist, the bath will not function properly and may even defy proper analytical control. This, admittedly, is rare but an extreme possibility. Every effort should be made to maintain a uniform solution. Occasional local analyses at selected spots or selected depths will reveal if variations of appreciable magnitude do develop.

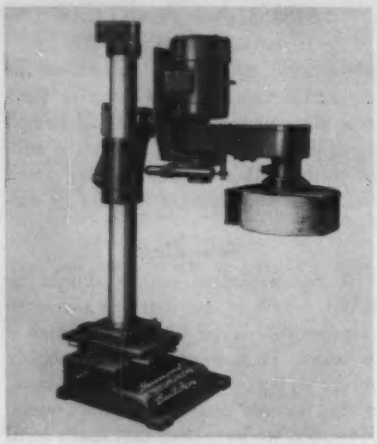
Sampling can be a problem and a challenge. The individual bath must be considered to deduce the means to take a proper sample.

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT FOR THE METAL FINISHING INDUSTRIES

Polishing Head

Hammond Machinery Builders, Inc., Dept. MF, 1601 *Douglas Ave., Kalamazoo, Mich.*



A new heavy duty floating type polishing or buffing head is available with 10, 15 or 20 hp motor and multi-v-belt drive. This head is suited to use on rotary automatic turrets or straight line conveyors where floating action on irregular shaped parts is required.

Steel Buffing Composition

Frederic B. Stevens, Inc., Dept. MF, 1800 18*th St., Detroit* 16, *Mich.*

A new liquid steel cutting composition enables metalworking concerns to substantially reduce their finishing costs on certain steel and stainless steel parts, it is claimed. This saving is effected by the elimination of the costly copper plate and copper buff operation previously required prior to putting bright nickel and chromium on steel.

Known as 55-L, this new liquid composition has an exceptionally fast cutting ability that results in good color and provides an excellent final plated surface appearance without further buffing.

Acid Cleaner for Metals

Enthone, Inc., Dept. MF, 442 *Elm St., New Haven, Conn.*

A non-flammable phosphoric acid type cleaner and deruster for most metals, named Enthol 59, is a blend of phosphoric acid with emulsifiers, solvents and penetrants which rapidly removes rust, metal oxides, oil and grease from metals in one simple operation. Additionally, it leaves a light phosphate film on steel and zinc which is an excellent base for painting or other organic finishing.

The cleaner can be used hot or cold and can be applied by dipping, brushing, swabbing or spraying. The working solution is made up by diluting with up to nine volumes of water. It can be operated at temperatures up to 180°F. for more effective cleaning without excessive loss of solvent due to evaporation. Despite its high phosphoric acid content, the material is effectively inhibited against attack of iron or copper alloys. In many instances, it has stripped residual paint and enamel from parts being prepared for repainting. Laboratory tests have demonstrated the product's ability to remove many types of smut and to convert dark, oily steel surfaces to a bright, clean condition.

Bright Dip for Copper and Brass

Conversion Chem. Corp., Dept. MF, Rockville, Conn.

Two new powders have been announced for bright dipping copper and brass. Kenvert #30-C is designed primarily for copper but may also be used for brass. Kenvert #30-B is designed primarily for brass, but can also be used for copper.

These new powders, mixed with water, produce a bath that does not fume, is stable, and permits easy control. The finished surface, after brightening, is passive. #30-C is also particularly suited for neutralizing copper plated parts before subsequent plate. It will work on cyanide or acid plated copper surfaces. #30-B is an excellent base for lacquer.

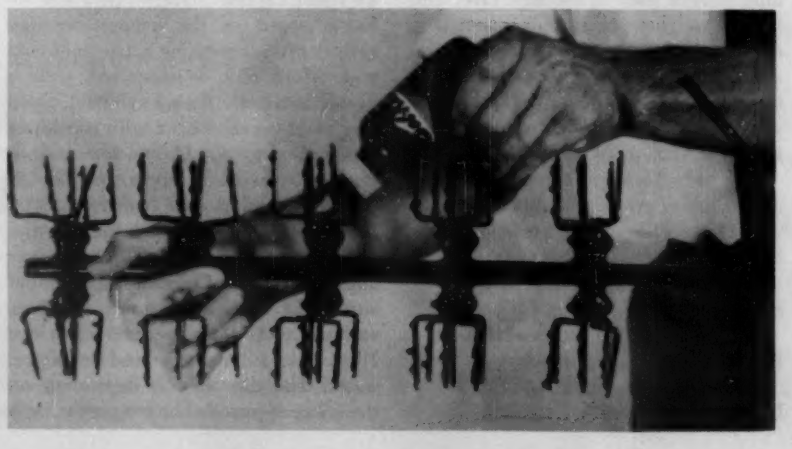
Because these new products are powders, not liquids, and there is no returnable package, lower freight rates result in savings in costs.

Plastisol Patch

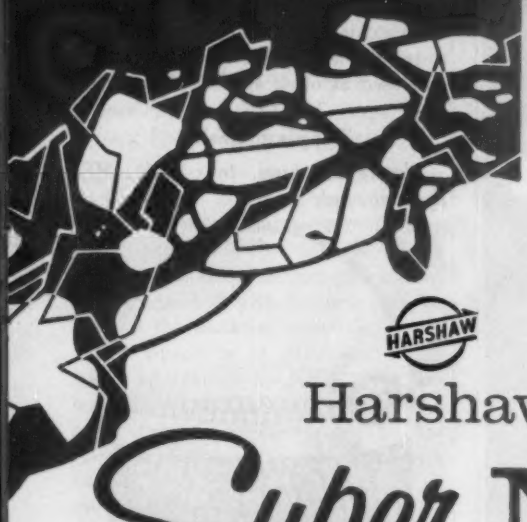
Sel-Rex Corp., Dept. MF, 75 *River Road, Nutley* 10, *N. J.*

A new plastisol can be sprayed, painted or dipped in coatings of 40 mils or more, for plating rack development, patching or general protective maintenance. The material is said to adhere to any metal, or other coatings regardless of how applied, producing a tough, non-contaminating insulator-surface. Requiring no ovens, special skill or facilities to apply, coatings air-dry for use in approximately 30 minutes.

According to the manufacturer, a "Squeez-on" applicator, filled with a



Harshaw Announces *Another Addition*
to its growing family of Bright Nickel Plating Processes

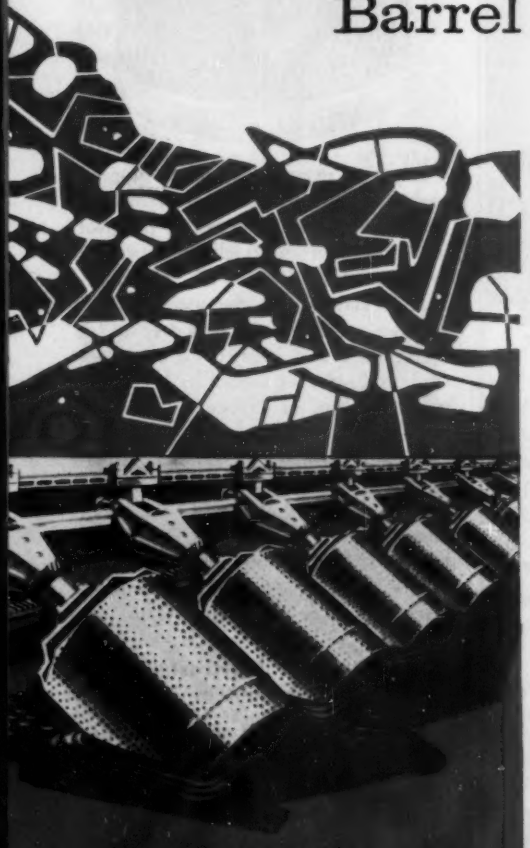


HARSHAW

Harshaw
Super NIBRITE
Barrel Bright Nickel Process

The Harshaw Chemical Company has developed the SUPER NIBRITE BARREL BRIGHT NICKEL PROCESS to produce a lustrous and ductile nickel deposit by the use of only two brighteners, both of which are liquid addition agents. These addition agents are non-metallic, organic type brighteners designated as BBN #1 (the primary brightener) and BBN #2 (the secondary brightener).

Among the many advantages of the SUPER NIBRITE BARREL NICKEL are its superior brightness, excellent leveling, ductility, ease of operation and control, tolerance to organic and metallic impurities, and its receptiveness to chrome plating.



Brightness. The SUPER NIBRITE nickel plate is bright over a wide range of current densities and temperatures.

Leveling and Ductility. For a barrel nickel the SUPER NIBRITE nickel plate has amazing leveling and ductility over its entire operating range.

Ease of Operation and Control. The recommended operating conditions for SUPER NIBRITE nickel are a pH of 4.0-5.0 and a temperature of wide range up to 140°F. The BBN #1 concentration can be high without any ill effect on the operation of the bath and since it is lost mainly only through drag-out, additions can be made in proportion to the nickel salts added to replace drag-out losses. The amount of BBN #2 used in any specific installation varies with the type of work, finish of the base metal, and the required finish. Additions can be made with ease prior to the end of plating time.

Tolerance to Impurities. SUPER NIBRITE solutions remain ductile and bright over long periods of operation due to the high tolerance of the solution to both organic and metallic impurities. There are no unusual breakdown products from the organic brighteners themselves and thus any measures taken to avoid severe contamination will result in trouble-free operation. Also carbon treatments and filtrations, if necessary, can be performed without undue loss of the brighteners.

Extended Periods of Idleness. SUPER NIBRITE baths can be operated after extended periods of idleness without sacrificing loss of brightness or ductility.

Speed. The greater conductivity and faster plating rates obtained by operating the solution at 140°F can be used to great advantage by reducing the plating time for a desired finish up to 50%.

Contact the Harshaw Branch nearest you. Harshaw representatives will be happy to discuss with you the application of this process in your plant.

The Harshaw Chemical Co.

1945 East 97th Street • Cleveland 6, Ohio

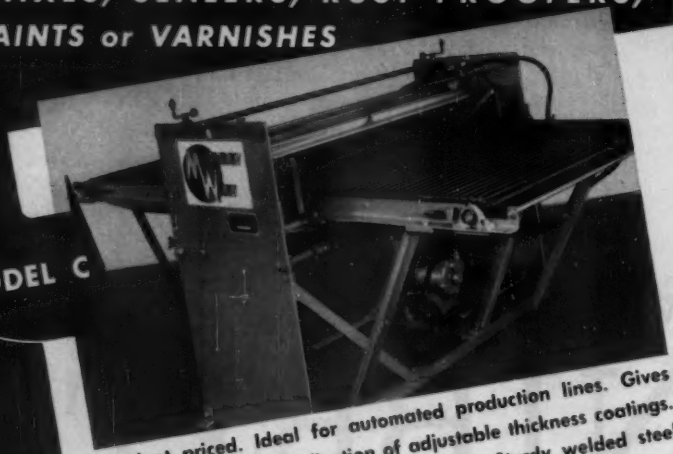
CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES

HASTINGS-ON-HUDSON, N. Y. • PHILADELPHIA • PITTSBURGH

MURRAY-WAY ROLLER COATERS

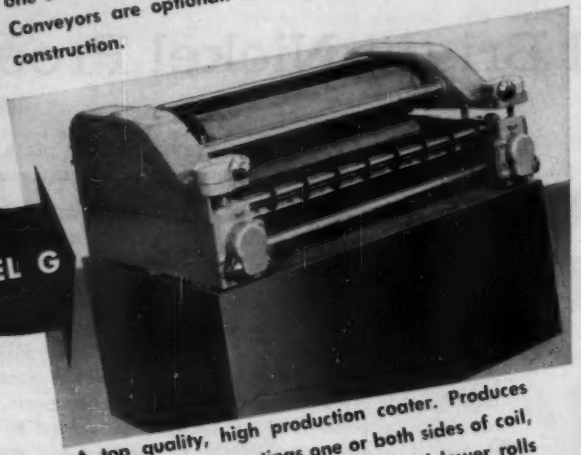
give you BETTER, FASTER, CHEAPER PRODUCTION COATING with COMPOUNDS, WAXES, SEALERS, RUST-PROOFERS, PAINTS or VARNISHES

MODEL C



Budget priced. Ideal for automated production lines. Gives one or both sides application of adjustable thickness coatings. Conveyors are optional. Simple design. Sturdy welded steel construction.

MODEL G



A top quality, high production coater. Produces vernier adjusted coatings one or both sides of coil, sheet or blanked material. Upper and lower rolls independently driven. Hinged construction affords fast access to rolls without disturbing drive adjustments. Shielded drive and bearings.

Murray-Way Roller Coaters are compact in design, built for toughest production jobs and will save their price many times in faster, low cost, uniform high quality production.

There is a standard Murray-Way Roller Coater model to fill most every requirement. Our engineering specialists will produce custom models for unusual applications.

Specialists in automatic metal finishing and materials handling equipment and systems.

MURRAY-WAY CORPORATION

P. O. BOX 180, MAPLE ROAD EAST · BIRMINGHAM, MICH.

generous trial quantity of the plastisol "armor," will be supplied free with initial orders at $7.95 per gallon — while the supply lasts. The applicator is said to have been specially designed for patching or maintenance of hard-to-reach places, and may be refilled and used as often as desired.

Dipping Basket

Plating Products, Inc., Dept. MF, Kokomo, Ind.

A new expanded metal dipping basket is made of uncoated plain steel or with a uniform coating of plastisol to protect it from attack by most corrosive solutions.

It is claimed by the manufacturer that the uncoated steel basket is useful in cleaning and degreasing processes while the plastisol coated basket is extremely useful in processing parts in bulk through corrosive solutions such as nitric acid bright dips, pickling solutions, etc. An added feature of this new product is that it can be used in many centrifugal dryers. These new baskets will give long service and are relatively inexpensive. The manufacturer assures prompt delivery.

Multi-Color Electrostatic Spray System

Ionic Electrostatic Corp., Dept. MF, Garfield, N. J.

This new system, designated as Model M-50, is adaptable for producing both single color and multi-color patterns or finishes. The system utilizes an array of variable speed electrostatically charged centrifugal atomizers

which blend coating materials to produce various types of multi-color mixed patterns previously unobtainable. Reciprocating and stationary models are available. All units are sold outright without any further obligations.

Paint Supply Pump

Spee-Flo Co., Dept. MF, 6614 Harrisburg Blvd., Houston 11, Tex.

The 2100 series paint supply pump is a compact 2-1 ratio supply pump which operates from the original five gallon paint pail. For continuous use on the same color, the ten gallon container furnished with the unit may be used as the material reservoir.

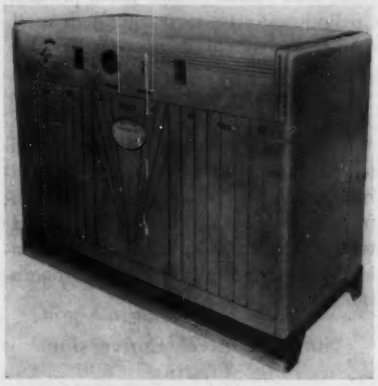
The pump is of divorced design which means that the pump in the material is completely separated from the air motor which actuates it. This insures maintenance-free operation. With an eye to expanding requirements of the user, this pump may easily be converted to a full length pump for use with conventional fifty-five gallon open head or bung type drum.

This new pump offers faster material handling, smoother regulated paint delivery and elimination of the time-consuming pressure tank shut-down for color change or material fill.

Solution Cooler

Kol-Flo Kooler Co., Dept. MF, Bayonne, N. J.

Complete packaged chilled water or acid cooling units are designed for precooling and temperature controlling of



plating, anodizing and chemical solutions. All "Kol-Flo" units have completely insulated chillers as well as the cold coolant lines, also enclosed control panel containing fully wired operating and safety controls for maintaining precise temperatures of the solutions.

The components include a complete Freon refrigeration system, chiller,

DETREX

PERM-A-CLOR (NA)*

*Industry's Finest Degreasing Solvent

Perfected in the laboratory, proven in thousands of field installations, DETREX PERM-A-CLOR (NA) (Trichlorethylene) provides an unequalled combination of quality, stability and cleaning ability.

Put these premium properties to work in your metal cleaning operation and you are assured of substantial savings in operating and maintenance costs plus increased quality.

Take advantage of DETREX's field service and years of experience in every phase of metal cleaning and processing to save your company thousands of dollars.

Depend on DETREX for Every Metal Cleaning and Processing Need

PERM-A-CLOR (NA) (Degreasing Solvent)
Solvent Degreasers
Phosphate Coatings and Paint Bond Compounds
Alkali and Emulsion Cleaners
Rust Proofing Oils and Compounds
Ultrasonic Equipment
Industrial Washers
Extrusion and Drawing Compounds
Spray Booth Compounds
Aluminum Finishing Compounds

DETREX CHEMICAL INDUSTRIES, INC.

BOX 501, DEPT. MF-11, DETROIT 32, MICHIGAN

automatic electrical controls, internally piped and wired, factory-tested and guaranteed. All components are sized, balanced and packaged at the factory to perform efficiently as a system.

The units are completely automatic, instant cooling and temperature controlled. They are available in sizes from 1 to 100 h.p. to meet all production operations. Chillers are manufactured in copper for cold water recirculation cooling and stainless steel or lead for direct acid solution cooling.

Rinse Additive

Aquadyne Corp., Dept. MF, Clark, N. J.

Hydrodyne-PR, a liquid additive, when used in plating rinses, drastically reduces or eliminates spotting out on copper and brass plated products, it is claimed. Besides solving the spotting out problem, it shortens rinse time up to 50% and, when added to a final hot water rinse, will significantly speed up drying. No chromic acid is required in the rinse for perfect results. Plated work remains bright. It is also claimed that when the product is used in immersion and electrolytic cleaners, the cleaning materials last longer, or clean better, or both. It is also stated to be effective in brass and copper baths.

Since it is highly concentrated, only one part is required for each 1,000 parts of water for effective performance in cleaning and rinsing. In plating baths the mix ratio is 500 to one. It is available in bulk at $9.00 per gallon in five gallon cans, at $8.00 per gallon in 55 gallon drums, F.O.B. Clark, New Jersey. A one gallon trial size is available at $9.95.

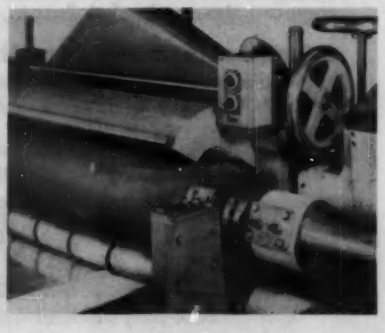
Spiral Wrap Abrasive Roll

Clair Mfg. Co. Inc., Dept. MF, Olean, N. Y.

Removable cartridge bearings permit the 9" dia. x 37" roll to be installed or removed from a Clair machine in less than two minutes. It comprises a cylindrical shell to which a rubber sleeve of ½" wall thickness is bonded. This sleeve may consist of any natural or synthetic rubber formulated in conformance with the degree of resiliency specified.

The roll incorporates novel indexing clamps at each end by means of which the spiral-wrap is secured and pulled taut in a matter of seconds, without removing the roll from the machine. The ease of application is such that the wrap presents a smooth once-around spiral butt joint without overlap.

With each of these roll assemblies, the manufacturer will include a metal template to serve as a pattern for cutting the wraps from standard 24" width sheet abrasive stock, without waste.



These new spiral-wrap rolls are interchangeable with the brushing, glazing, polishing or buffing rolls commonly used; thus expanding the versatility of the firm's machines the equivalent of any normal abrasive belt operation.

Stainless Steel Conversion Coating

Amchem Products, Inc., Dept. MF, Ambler, Pa.

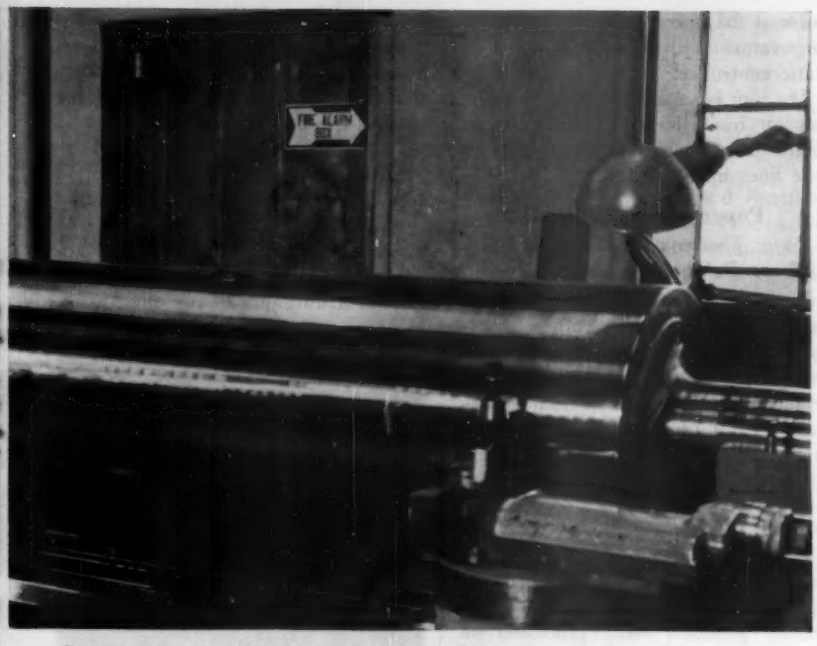
Serseal No. 32, designed especially for the "Granodraw" SS oxalate coating process on stainless steel to facilitate drawing, produces a di-phase bath, reduces normal loss of unstable chemicals usually found in this type of process by approximately 50%, while re-

The 152-in.-long, 3-ton rotogravure cylinder above will be used to print patterns on vinyl-plastic floor coverings. National Gravure

New rotogravure plant plates rolls up to 152" long — keeps quality high, costs low with "Plus-4" Copper Anodes

The big new plant of National Gravure Cylinders, Inc., in Long Island City, N.Y., was designed to embody the most modern equipment, new and improved methods for the economic production of quality gravure cylinders.

In king-size acid-copper electroplating tanks, 152-in., 3-ton, rolls shown above get a dense, uniform shell of copper .030" thick. Other tanks produce cylinders in sizes more commonly used. All tanks have used "Plus-4" Phospho-



Cylinders, Inc., also makes the more common cylinders used for commercial-advertising package wraps, cartons and labels.

rized Copper Anodes since the plant opened a little over a year ago.

The results: **1.** No scrap—anodes are completely used up in the tanks. **2.** Practically no sludge. **3.** Simple tank maintenance — solution concentrations are tested occasionally and only minor corrections have to be made.

WRITE FOR INFORMATION on how you can obtain a test quantity to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

58128

ANACONDA®

"PLUS-4"® ANODES Phosphorized Copper

MADE BY THE AMERICAN BRASS COMPANY

ducing normal heat requirements for the operation by approximately 75%.

Plating Power Supply

Ramyr Mfg. Co., Dept. MF, 1779 *N. Main St., Los Angeles* 31, *Calif.*

Three outstanding exclusive features of the new "Electronic Plater" include: (1) Sangamo ampere hour meter, available in various sizes, to accurately measure deposition of metal and to determine amount of metallic content to be replaced; (2) 0 to 1 ammeter with 20 milliampere graduations, assures accurate reading for plating of minute parts. A separate fuse on the meter protects against overloads; (3) Automatic timer regulates plating interval, includes a switch to by-pass timer unit when longer plating cycle is desired.

In addition to these above exclusive features, the new plater has these additional quality features: 0 - 10 ammeter for normal operation; 0 - 10 voltmeter; stepless voltage control from 0 - 8 volts; full wave selenium rectifier, convection cooled. Input current, 115 volt single phase, 60 cycles; filtered DC output, 0 - 8 volts, 10 amp. with less than 1% ripple.

Overall size of the plater is 14¼" high x 14½" deep x 21½" wide. It is also available in 20 ampere and larger sizes according to specifications.

Recording Temperature Controller

The Partlow Corp., Dept. MF, 508 *Campion Road, New Hartford, N. Y.*

A pneumatic recording temperature control is designed to utilize a 15-pound air line to actuate an air-operated steam valve or other air-operated device. It is available in any of 10 optional temperature ranges within the extremes of —30 to 1100°F. It features a 10-inch circular chart either electric or spring driven for 24 or 48-hour or 7-day periods. One of the features is a readily adjustable throttling range, 3-20%.

The instrument is actuated by a mercury-filled thermal element. The control varies the air pressure between the control and the air operated valve in direct proportion to temperature changes. A rise in temperature at the point being controlled is sensed by the control which modulates the air pressure to the air-operated valve or device. Depending upon the degree to which the heat has risen, the valve will restrict the supply of heating medium.

The control has a built-in fail-safe provision in its design. The valve or device is automatically shut off completely by the control if there is any failure in air supply to the instrument. This eliminates any possibility of damage by the uncontrolled heating medium.

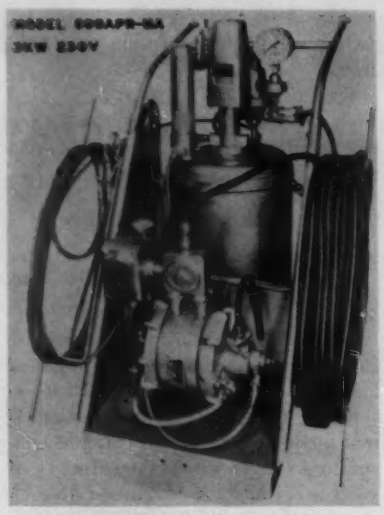
Accessories recommended for use with the control including an air filter, regulator, gages and an air-operated diaphragm valve are available as an optional package, the company announced.

Airless Paint Spray System

Spee-Flo Co., Dept. MF, 6614 *Harrisburg Blvd., Houston* 11, *Tex.*

Chieftain HydraAirless is a completey new and portable airless paint spray system based on hydraulic atomization. The moderately-priced unit offers the advantage of almost total elimination of overspray resulting in material savings of up to 40% and permitting work in open areas without the use of a conventional spray booth.

The system, based on mechanical atomization, requires that viscosity-



controlled paints be forced through a specially designed orifice at high pressure. Desired atomization is achieved through control of viscosity, orifice and pressure. No atomizing air is used.

Completely self contained, the unit combines the explosion-proof, Spee-Flo heater and divorced action pump in a mobile unit which carries the original five or ten gallon container. Circulation is maintained for temperature control and the operator can select paint temperature by turning the Dial-a-Matic controller.

The unit is capable of operating one gun on hose line up to 75 feet in length or two guns simultaneously on hose lines up to 50 feet.

Paper Thermometers

Paper Thermometer Co., Dept. MF, 10 Stagg Drive, Natick, Mass.

Thermopaper and Thermotube paper temperature indicators are now available for 100, 105 and 110°F to supplement the previous range of 115 through 490°F. They measure temperature by exhibiting an irreversible color change when subjected to predetermined temperatures. Speed of response is faster than a tenth of a second and accuracy is one per cent.

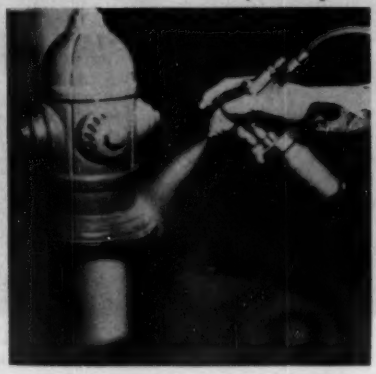
In paint and finishes technology these indicators are useful for measuring temperatures of paint and lacquer finished products being processed in drying and curing ovens.

Miniature Spray Gun

Eclipse Air Brush Co., Dept. MF, 390 Park Ave., Newark, N. J.

The new Mini-Rod hand gun is light weight and versatile, ideal for light products finishing and touch-up operations. It features a finger tip snap action which adjusts the fan control for either of two spray patterns, cone to wide fan, cone to narrow fan.

Equipped with a four-ounce syphon cup, the new model may also be used from a tank for pressure feed. The plunger is removable and may be adjusted for wear without the use of tools or disturbance of any other parts.



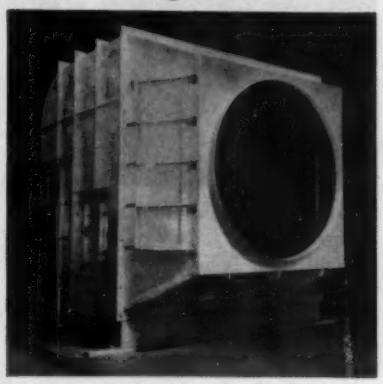
Easy to maintain, the clean design leaves no projections or indentations to fill up with dried paint or other exterior debris.

CUTTING COSTS WITHOUT CUTTING CORNERS
SCOTT," THE HEAT'S ON. WE'VE GOT TO CUT OUR COSTS TO COMPETE WITH OTHER ENAMELING JOB SHOPS. I CALLED YOU BECAUSE...
W. Scott McCormick, Pennsalt Representative
WELL, THE ONLY REAL WAY TO CUT COSTS IS TO LOOK AT THE WHOLE PICTURE AT ONCE. NOW HERE'S HOW WE THINK YOU CAN GET BEST RESULTS FROM THE PENNSALT CLEANERS, CAUSTIC SODA AND SULFURIC ACID WE SELL YOU, AS WELL AS THE CHEMICALS LIKE NICKEL SULFATE AND SODA ASH YOU GET FROM OTHER SUPPLIERS.
SEVERAL WEEKS LATER...
HOW'S IT GOING, CHARLIE?
TERRIFIC, SCOTT. WE'VE GOT OUR CHEMICAL COSTS DOWN CLOSE TO HALF A CENT PER SQUARE FOOT—MORE THAN 60% BELOW THE NATIONAL AVERAGE! THAT SURE HELPS GET BUSINESS. WHAT'S MORE...

All Plastic Fume Washer

Heil Process Equip. Corp., Dept. MF, 12901 Elmwood Ave., Cleveland 11, Ohio.

The photo shows one of the largest solid plastic structures ever built for handling and scrubbing chemical corrosive fumes. This washer is 12′ high, has a 7′ diameter outlet, and was constructed of a special epoxy formulation reinforced with glass fiber.



An advantage in the all plastic construction is that it requires no painting or maintenance in the portions exposed to outside weather. Another advantage is the light weight, enabling placement on roofs without exceeding roof loading limits.

Protective Coating

Tropical Paint Co., Dept. MF, Cleveland 2, Ohio.

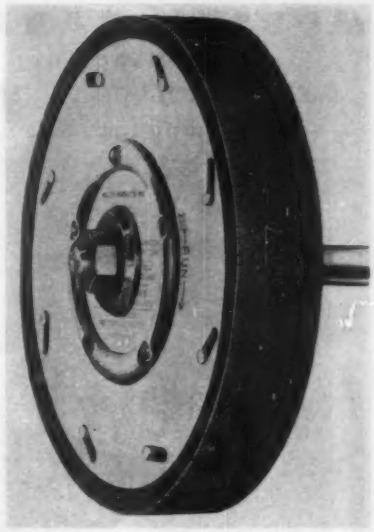
With loose rust removed Rustikote is claimed to bond firmly to the surface and to pitted areas and set up a hard, dense, protective film. It is formulated for the one specific job of protecting rusted surfaces from further rusting and is made in clear and aluminum finishes.

The material is an excellent finish in itself without additional finish coats.

Expanding Abrasive Wheel

Miller Products Co., Dept. MF, 1438 12th St., Box 325, North Chicago, Ill.

A new type of expanding wheel for circular abrasive belts is self-balancing and maintains a flat edge, so that it can be used for such work as polishing and tool grinding as well as rough deburring. The wheel has a floating action which frees it from edge distortion due to centrifugal force, and allows it to achieve dynamic balance in operation. The resulting smooth operation gives fast cutting action and long belt life.



The wheel accommodates an abrasive belt 1¼ in. wide and 21 in. in circumference, plus or minus $\frac{1}{32}$ in. Its Neoprene wheel is retained between, but is not bonded to, side flanges.

Eight pins, equally spaced in a circle near the rim of the wheel, extend through the rubber and into diagonal

...EVER SINCE WE STARTED BUYING SOME PENNSALT CLEANERS A FEW YEARS BACK, YOU'VE TOLD ME ABOUT THE COMPLETENESS OF YOUR SERVICE. CAN YOU HELP US GET OUR CHEMICAL COSTS DOWN?
GLAD FOR THE CHANCE, CHARLIE.
LATER THAT WEEK...
HERE ARE OUR RECOMMENDATIONS, CHARLIE, BASED ON WHAT I KNOW ABOUT YOUR SET-UP, PLUS THE ADVICE OF OUR LAB PEOPLE.
SAY, YOU'VE COVERED CHEMICALS YOU DON'T EVEN SELL!
...WE'VE CUT REJECTS WAY DOWN, TOO. YOUR RECOMMENDATIONS REALLY PAID OFF.
GLAD WE COULD HELP. WHEN WE SELL CHEMICALS, WE TRY TO DELIVER A LOT MORE.

Cutting costs without cutting corners is a specialty at Pennsalt. Ask your Pennsalt man how his *complete* surface preparation service can help you get "A BETTER START FOR YOUR FINISH."

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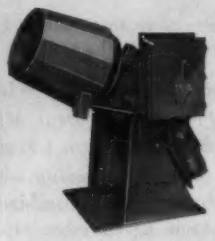
ESTABLISHED 1850

A better start for your finish

MODERN BARREL FINISHING
methods and machines can
IMPROVE PRODUCTS . . . SPEED WORK . . . CUT COSTS
FINEST QUALITY U. S.-BUILT BAIRD MACHINES COST AS LITTLE AS $250.00.

SEND FOR THIS NEW
and comprehensive
BAIRD Service
Catalog.



POLIACTION
ELECTRATILT MODEL
(To J.I.C. Stds.)

NEW "POLIACTION" BARREL FINISHING MACHINES
NEW "MULTIPACT" MULTIPLE HORIZONTAL MACHINES
STEAM AND ELECTRICALLY HEATED BARRELS
BALL BURNISHING MACHINES • TUMBLING BARRELS

BAIRD . . . one of the oldest and largest manufacturers of Barrel Finishing Equipment . . . is your headquarters for practical help on your problems. It always pays to . . .

Write Dept. MF. *Ask BAIRD About It!*

BAIRD
Builders of High Production Machinery Since 1846
THE BAIRD MACHINE COMPANY, STRATFORD, CONNECTICUT

slots in the flange plate on each side. Because the pins are free to move in the slots, the wheel is free to adjust itself in operation and maintain perfect dynamic balance under all conditions. Since the wheel is retained by these pins, not attached to a hub, its edge remains flat instead of being distorted by uncontrolled centrifugal force. The pins also make the wheel explosion-proof. Belts will not slip under heaviest work loads or corner grinding, because of the uniform expansion of the rubber due to centrifugal force.

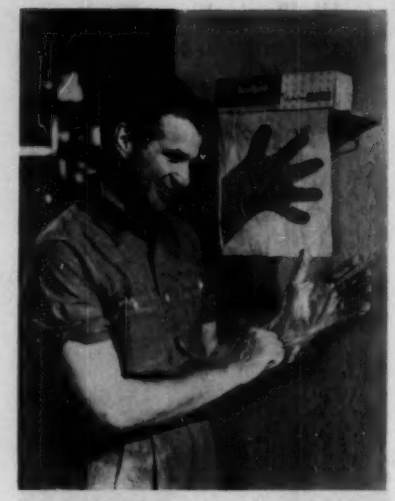
The new wheel is available in two versions: No. 7125—1725 can be used at any speed between 1250 and 2250 rpm, and No. 7125-3450 is designed for operation at 3450 rpm. Both are supplied for mounting on standard motor shafts.

Plastic Gloves

Plasticsmith, Inc., Dept. MF, Box 415, Concord, Calif.

New plastic gloves are rugged enough to be re-usable and inexpensive enough to be disposable. The gloves, available in large, medium and small sizes, are packaged in convenient rolls of 12 to 1,000. Price in rolls of 1,000 is about 3 cents per glove.

Known as Handgards, the gloves for industrial use are made of 1¾ mil polyethylene material, heat sealed by a patented machine which insures a waterproof product. They are pre-talcumed for ease in sliding on and off. Although strong, they do not impair



the sense of touch as do gloves of other materials.

Ventilation is improved over tight-fitting gloves by the design of the gloves, which are flared at the wrist, and yet can easily be sealed with a rubber band when the hands need to be immersed. The finger-puckering caused by the tightness of rubber gloves is eliminated in most cases. Industrial gloves of heavier weights, longer lengths, with perforated backs for additional ventilation, or any special color or design can also be provided.

Aluminum Test In Bright Dips

Fisher Scientific Co., Dept. MF, 369 Fisher Bldg., Pittsburgh 19, Penna.

A method for the fast colorimetric determination of aluminum in phosphoric acid bright dip baths involves the use of aluminon, which has been used only rarely in the presence of phosphate because of a negative interference. However, in the new method, this interference is minimized by regulation of sample size, pH and reagent concentration.

Catalog number for the Aluminum Bright Dip Test Solution is So-V-20. Price: about $13.50 per case (six 1-quart bottles).

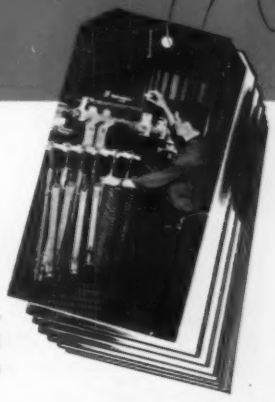
Dry Honer

Vacu-Blast Co., Inc., Dept. MF, P.O. Box 855, Belmont, Calif.

The Dry Honer is claimed to be the first proven honing machine to suspend its abrasive or blasting powder entirely in an air stream, 100% free of water or other liquids. In the absence of any liquid carrier, far more abrasive can be blasted with an active air supply, it is claimed. Alternately, a much more finely divided powder can be used with

From H-VW-M

10 important ways to keep metal finishing costs down



All the processes, supplies and equipment in H-VW-M's line have been designed for maximum efficiency and cost savings. But among this full line are a group of products and processes which—if they apply to your operations—can offer outstanding costs and labor saving advantages. Included in this group are high-efficiency electrical and processing equipment, unusual processes, and finishing supplies having unique advantages.

The scope of the exceptional H-VW-M products, described on the following pages, covers a wide range of plating and finishing operations of every type, and the likelihood is strong that several, or perhaps all, are applicable to your plating plant. By investigating all of them, you should strike just the process, equipment or supplies you need to effect very real economies in your operations.

HANSON-VAN WINKLE-MUNNING COMPANY

MATAWAN, NEW JERSEY

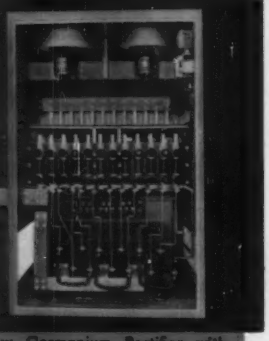
Manufacturers of a complete line of electroplating and polishing processes, equipment and supplies

PLANTS: Matawan, N. J. • Grand Rapids, Michigan • Los Angeles, California (Alert Supply Co.)

Sales Offices: Anderson (Ind.) • Baltimore • Beloit (Wisc.) • Chicago • Cleveland • Dayton Detroit • Grand Rapids • Los Angeles (Alert Supply Co.) • Louisville • Matawan • Milwaukee New York • Philadelphia • Pittsburgh • Plainfield (N. J.) • Rochester • San Francisco (Alert Supply Co.) • Stratford • Toledo • Utica • Wallingford (Conn.) • West Springfield (Mass.)

10 important ways to keep

ELECTRICAL AND PROCESSING EQUIPMENT



New Germanium Rectifier with panel removed to show simplified construction.

Manual Tap Switch Control

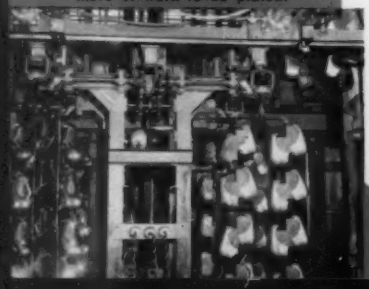
Motor Operated Tap Switch Control

Continuously Variable Auto-Transformer

Saturable Core Reactor

Operator is shown adjusting the Dial-A-Cycle mechanism that will determine the cycle for this rack of work.

Automatic loader-unloader has just removed two racks of plated bumper guards and loaded two more of work to be plated.



GERMANIUM RECTIFIERS

H-VW-M Germanium Rectifiers, known for efficiency, operating economy, compactness and close voltage control, are available in 6 to 150 volt capacity, with current outputs from 500 to 10,000 amperes. Designed for 24-hour-a-day operation at full capacity, with outputs of 12 volts or more, they have efficiencies up to 92%. Exceptional efficiencies are attained at ¼ and ½ loads. Voltage regulation as low as 5% can be obtained from no load to full load on some models at voltage ratings of 20 volts and above. Available with various types of voltage controls, manual or automatic, in self-contained or remote-controlled models.

Also look into the revolutionary new low cost line of Powertron Germanium Rectifiers—an H-VW-M first—with exclusive new features. These include: no-fuse DC protection system, no paralleling of junctions, high efficiency and improved regulation of germanium, 44 control positions with range of 2 to 12 volts, and less than 5% ripple. Available in ratings of 750 amperes, 1500 amperes, and 3000 amperes. Something special in packaged units and you get all the advantages at a new low price. If one of these fits your plating requirements, then you've got a real bargain. Immediate delivery. Write for catalog.

RECTIFIER CONTROLS

H-VW-M offers a complete line of rectifier controls to provide for many control functions. Used with either selenium or germanium rectifiers, these controls, properly applied, permit the most efficient control possible. Such devices as manual and motor operated tap switch controls, continuously variable auto-transformers and saturable core reactors are used with or without supplemental controls to provide automatic voltage stabilization, automatic current stabilization as well as automatic programming. H-VW-M Bulletins ER-108 and ER-109 further explain economical H-VW-M Rectifiers and Controls. Write for it.

FULL AUTOMATIC CONVEYORS

For well over 30 years H-VW-M design engineers have worked continuously for improvements in the automatic conveyors for electroplating and allied operations in which H-VW-M pioneered.

Today's full-automatic conveyors are a far cry from the conveyors produced by H-VW-M as early as 1922. But one thing remains the same—and that is H-VW-M's desire to provide the most advanced and efficient equipment possible. Scores of innovations and improvements resulting from continuing H-VW-M research mean today's H-VW-M Full Automatic Conveyors offer the ultimate in service and efficiency for peak production of the highest quality at lowest cost.

DIAL-A-CYCLE CONTROL

Exemplifying the many H-VW-M developments contributing better, easier plating, is the remarkable new DIAL-A-CYCLE Control. This unique selective by-pass mechanism—of particular interest to aluminum anodizers—permits a whole series of different operations and cycles in one full automatic conveyor. Length of any treatment time can be varied, and, in anodizing, different colors can be anodized in one continuous operation, and in any sequence. It is a truly revolutionary device, resulting in remarkable labor savings and increased production.

AUTOMATIC LOAD-UNLOAD

Automatic Load and Unload is another recent development of H-VW-M that contributes to greater economies in the plating room. This new transfer unit, operating the same indexing sequence between plating conveyor and a monorail conveyor loads and unloads racks automatically. Manual handling is eliminated by this major advance towards automation in metal finishing.

This, of course, is just one of many types of conveying equipment offered to metal finishers. Return type conveyors, elevator conveyors, high-lift conveyors, straight line conveyors, and others—of every description are H-VW-M designed, manufactured and installed. If you'd like to know more about the cost-saving story of H-VW-M Full Automatic Conveyors, write for Bulletin FA-105.

metal finishing costs down

BUFFING AND CLEANING SUPPLIES

BUFFS

Tufta-Flex and Sisal-Flex Buffs

Speed and economy are embodied in two new H-VW-M Buffs for thorough cutting and coloring on contoured surfaces. For medium and heavy duty, SISAL-FLEX Buffs with sisal-cored tufts are available, and for light to medium duty, TUFTA-FLEX Buffs, having full cloth tufts, are offered.

Both buffs feature double-folded tufts for maximum cutting surface, and to retain compound on the leading edges and ends of the tufts. To prevent streaking, tufts are staggered in a double row around the buff. Cool running, a feature of both buffs, is the result of staggered tufts, plus a pattern of ventilating holes in the rugged steel center. Fraying, which is wasteful and expensive, is ruled out by the bias-cut construction of both cloth and sisal.

These time and cost-saving new buffs are available in standard diameters from 12 to 18 inches.

BINDERIZED® RUFF-L-BUFFS

"BINDERIZED" Ruff-L-Buffs are pre-treated with a high quality compound binder. Because every fibre is impregnated with the same binder used in buffing compounds, Binderized Ruff-L-Buffs are ready for operation at top efficiency from the very first piece.

The cost-saving advantages of Binderized Ruff-L-Buffs are many. "Heading-up" is eliminated, thus break-in time is radically reduced. Because of the natural affinity between the Binderized Ruff-L-Buffs and the compound, the compound lasts far longer, and is easier to apply. Naturally, much better cut is obtained because of the high amount of compound carried.

Perhaps the greatest advantage of Binderized Ruff-L-Buffs is their internal lubrication which prevents wear inside the buff (see photos). Wear is even—and up to 30% longer. To learn more about the unusual economies of Binderized Ruff-L-Buffs, write for Bulletin No. B-103.

Plain Ruff-L-Buff (below) after wearing off 1 inch in test. Loose threads, numerous holes and breaks due to excessive heat and abrasion are apparent.

Binderized Ruff-L-Buff (below) after same test. Notice absence of thread or cloth breakage, convincing proof of Binderizing's effect on buff life.

LIQUIMATIC COMPOUNDS

and application equipment

Buffs "live" up to 200% longer . . . No compound waste . . . Reduced labor costs . . . Fast cutting, easy cleaning—all these advantages and more are embodied in the unusual Liquimatic Liquid Compounds and application equipment.

Because of the enormous economies of using the Liquimatic System, the system soon pays for itself in buff, compound and labor savings.

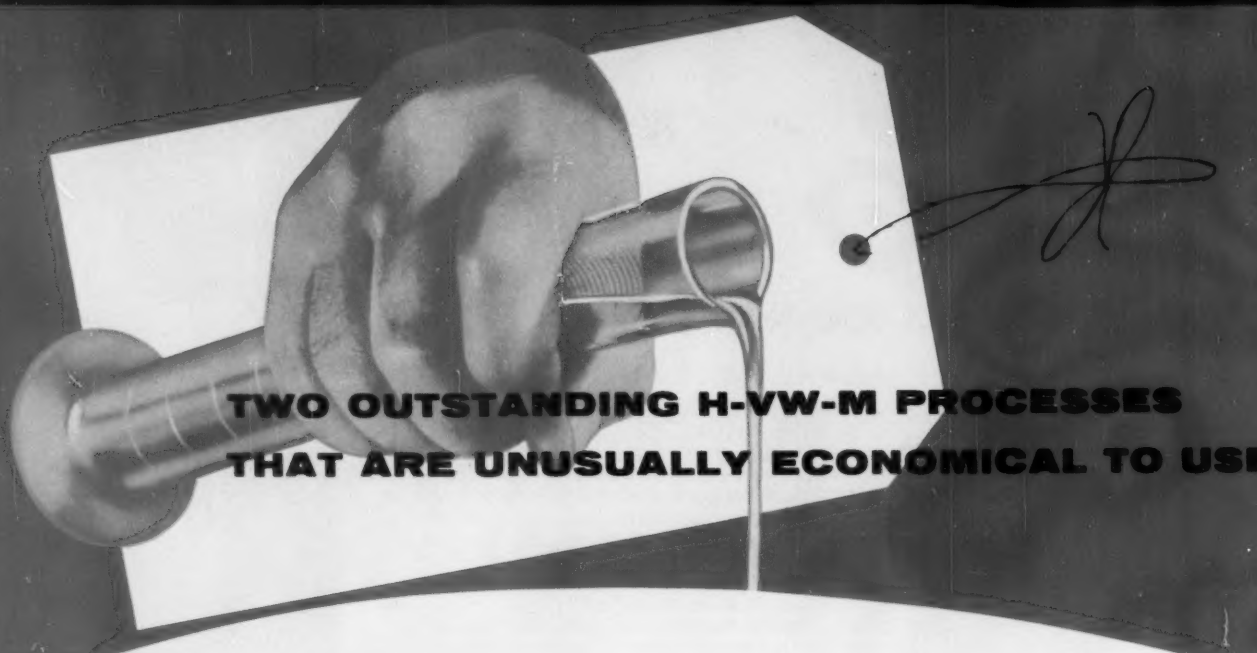
A complete line of Liquimatic Compounds is available for cutting and coloring ferrous and non-ferrous metals. These provide an adhesive, slow-wearing buff face, and have a high safety factor because of their high flash point. All are of sprayable viscosity, and have a long storage life. Write for H-VW-M Bulletin No. Co-103, which fully describes Liquimatic and other economical H-VW-M Compounds.

85-S ALUMINUM CLEANER

H-VW-M devotes constant research to the subject of cleaners and the result is a comprehensive line of Matawan Cleaners giving superior results in soak cleaning, power spray operations, oxide removal, and special cleaning and etching operations.

Of particular importance is H-VW-M's new 85-S Aluminum Cleaner, which offers interesting advantages to aluminum finishers. It prevents scale formation, for instance, thus keeping coil and tank walls scale free, and it leaves an extremely bright surface. Its built-in regenerator makes maximum effective use of caustic in the bath.

H-VW-M Bulletin C-108 tells about this unusual cleaner, and other Matawan Cleaners offering unusual money-saving advantages.



TWO OUTSTANDING H-VW-M PROCESSES THAT ARE UNUSUALLY ECONOMICAL TO USE

LEVELUME

H-VW-M's new LEVELUME represents a milestone in nickel plating processes. It is the first bright nickel process to combine qualities of full brightness, high leveling and exceptional speed. In high-production installations, deposition rates with LEVELUME are 100% higher than those obtained with any other process, but will require some air agitation equipment.

Conversion to Levelume is simple, involving no new investment in conveyors, or tanks.

Key to the new process are its addition agents. With them an activated carbon pack can be used in the plating solution filter. This constantly removes harmful organic contaminants, preserving the purity of the bath, and consequently contributing to the economy of the process.

A few of the additional benefits include high surface activity, good ductility, controlled stress, and the feasibility of double coatings. A full description of the process–one in the family of NICKELUME processes – is available in the Levelume Manual, which is available on request.

CADALUME

H-VW-M's New Cadalume Process has all of the extras that you have been looking for in cadmium plating. It is the newest and best answer because it does the job faster and better. The new improved Cadalume Process of H-VW-M *lets you get at least 80,000 ampere hours for every gallon of brightener consumed. And bright dipping is eliminated for most applications!* The secret? It's simply this: You use two different Cadalume Brighteners. One is the Cadalume Make-Up Brightener and you use it only when you make up a new bath or convert an existing one. The other —Cadalume Brightener—is the strong addition agent used for all maintenance.

Here's why Cadalume keeps your costs low: The bright range is increased up to 10% . . . you get very high plating speeds—up to 10% increase . . . 4 times longer bath life . . . better distribution . . . and the brightener is more stable—it won't plate out. This simple, easy-to-operate economy is something for you to see. Ask for the New Cadalume Technical Manual.

H-VW-M PROCESSES, SUPPLIES AND EQUIPMENT KEEP PLATING ROOM COSTS DOWN . . .
They're Always Your Best Buy!

SINCE 1920

HANSON-VAN WINKLE-MUNNING COMPANY
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3983

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equal efficiency. A wider range of parts can be cleaned and polished due to the total absence of corrosion-inducing liquids. A quick blow-off of the dry abrasive leaves the part immediately ready for the next step. This is the only machine which separates the debris from the blasting powder, through stratification of the fluidized bed of abrasive during each re-cycling.

Completely self-contained, the unit may be operated at any desired point in the normal production line — even directly adjacent to the paint booth.

Abrasive Blast Barrel

Pangborn Corp., Dept. MF, Hagerstown, Md.

The new high-capacity 20 cubic foot Rotoblast barrel, designated as Type "20 GN," has several features aimed at increasing cleaning speed and flexibility while reducing abrasive loss. A 30 HP motor allows the 195-3 "RG" wheel to throw 50,000 lb. of abrasive per hour for rapid blast cleaning. One of the outstanding features is the new, extra-heavy work conveyor which allows loads up to 3500 lb. with single pieces weighing up to 800 lb. each, to be handled in the machine. For extra economy of maintenance, the wheel housing is completely lined with "Wear-Resist" alloy plates.

The barrel is driven by V-belts to a spur gear reducer mounted directly on the work conveyor shaft. When the barrel is operating, the conveyor travels upward to tumble the castings. After the cleaning operation, direction of the conveyor is reversed and the load is discharged. Conveyor take-up is located on the bottom shaft where weight of the conveyor makes it easier to adjust.

Abrasive-tight doors and housing have been developed to retain abrasive within the machine and permit economical use of new types of abrasives. Power operated, the doors move on rollers in a mechanical labyrinth. The solid steel plate upper door rolls up, permitting easy access to the cleaning chamber. The "break away" opening action on this door is another special feature of the new Rotoblast design. In raising to open, this new door moves from a slanting closed position to a vertical open position which allows ample room for locating abrasive separation equipment above the work cabinet, permitting efficiency not possible in any other location.

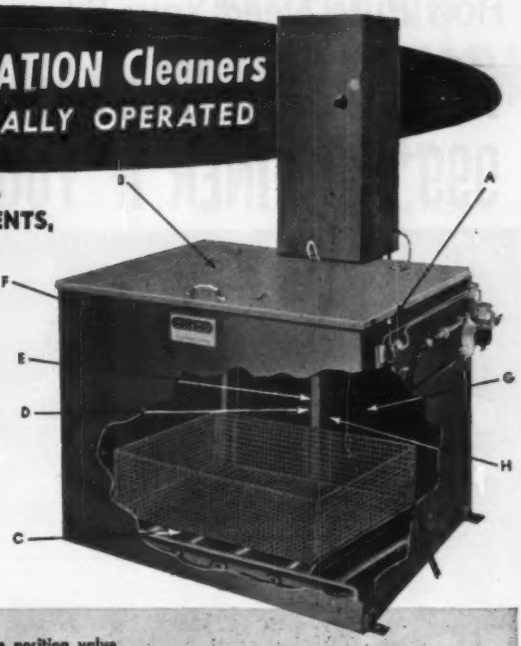
The lower door, which retracts under the work conveyor, is steel mesh backed with vulcanized rubber. It is powered with an air cylinder and tied in electrically so that it is impossible to run the work conveyor in reverse unless lower door is retracted. It is impossible to run the work conveyor forward unless lower door is raised to closed position.

During barrel operations, an unusually effective abrasive cleaning and reclaiming system is constantly at work removing all sand and debris to maintain the full efficiency of the abrasive.

A quick-acting work loader, with double cable for safety, delivers each batch into the machine. A control panel has been conveniently located alongside the cleaning chamber opening and push buttons are used.

Power AGITATION Cleaners
PNEUMATICALLY OPERATED

FOR USE WITH ALL CLEANERS — SOLVENTS, EMULSIONS, PHOSPHATIZING AND ACID SOLUTIONS FOR HEAT TREATING, QUENCHING, WAX AND PROTECTIVE COATING AND OTHER LIQUID PROCESSING.



A. Only one control—three position valve. 1. raises rack. 2. lowers rack for soak. 3. agitates rack.

B. Hinged steel cover. Fusible link causing lid to drop in event of fire, optional.

C. Supplied with grate platform. Roller rack platform available.

D. Length of up and down stroke variable from 4" to 27"

E. Number of strokes variable from 32 to 70 per minute.

F. Tank shell is fabricated of solid heavy gauge hot rolled steel.

G. Available with immersion heating choice of steam - gas or electric.

H. The same air operated piston lowers, raises and agitates the rack.

Since 1923 CIRCO EQUIPMENT COMPANY

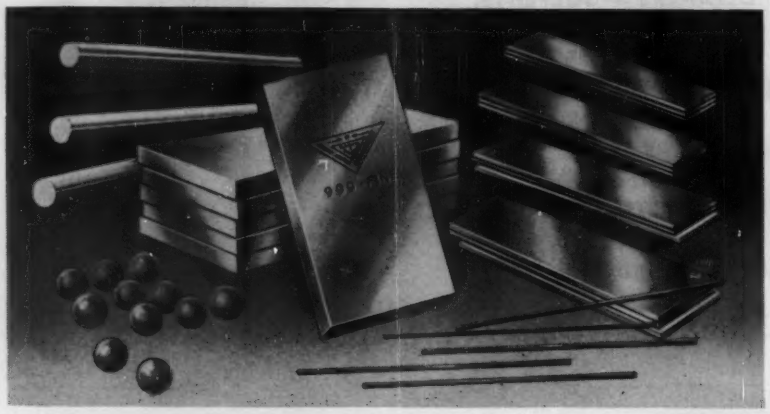
Write for New 4-page Brochure with Complete Information on All Models.

51 TERMINAL AVE., CLARK, NEW JERSEY

Offices and Representatives in Principal Cities

How Pure Need Your Silver Anodes Be?

HANDY & HARMAN MAKES THEM 999+ OR FINER IF YOU SPECIFY



For general commercial work, Handy & Harman anodes are 999+ fine. And it makes no difference in what shape or size they're made: ball, rod, plate, strip or sheet, they all have the same uniformly high degree of purity. What's more, if you want still finer anodes, you can specify the AA grade for high-speed plating, or finer, if desired. Handy & Harman supplies them all.

Your "fineness need" is our first concern. You can be sure that you'll get *exactly* what you want in anodes from Handy & Harman... thousands of manufacturers will agree.

MANY HAPPY RETURNS

Handy & Harman Refining Service has reached a state of perfection that assures you —in lot after lot—of *accurate* returns. Your anode ends, plating solutions, precious metal scrap, sweeps and waste are more *rewardingly handled* by Handy & Harman.

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

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HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

Ship refinings to the nearest of these plants:

WEST COAST	CENTRAL U. S.	EAST COAST		
330 N. Gibson Rd. El Monte (Los Angeles), Calif.	1900 West Kinzie St. Chicago 22, Ill.	82 Fulton St. New York 38, N. Y.	Bridgeport 1 Conn.	425 Richmond St. Providence 3, R. I.

Treated Buffs

American Buff Co., Dept. MF, 2414 S. La Salle St., Chicago 16, Ill.

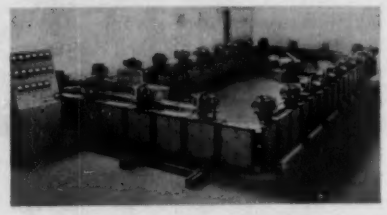
"8108" lubricates and softens cotton and sisal buffs to achieve an unusual degree of flexibility. After treatment the buff easily penetrates narrow grooves, follows curves and contours, and produces a superior finish in fewer passes, it is claimed. This ability simplifies and speeds production and affords comparable labor-cost savings. By fusing with the buffing compound the finish, which has a slightly adhesive texture, retains the buffing compound longer, with accompanying savings through full utilization and less waste of this item of production cost.

Polishing Conveyor

Murray-Way Corp., Dept. MF, Birmingham, Mich.

A completely new, multi-purpose conveyor with horizontal and vertical platens and sealed line construction is available in rectangular or straight-line design, and can be equipped with continuous drive or variable station-dwell.

A major feature of the new design is that the platens form an efficient, protective seal with each other and with the frame, affording complete protection for roller supports, drive chains, and guides from destructive abrasives and dirt.



Wide versatility of use is made possible by simply mounting fixtures on the vertical or horizontal platens or on both at the same time. Fixtures may be fixed mount, revolving or cam indexed, as desired.

Dependable electro-mechanized controls afford further flexibility and simple, accurate operation on all types of high production buffing and polishing.

High Temperature Masking Tape

Permacel, Dept. MF, New Brunswick, N. J.

A new pressure-sensitive masking tape is claimed to be capable of withstanding temperatures of up to 425°F even when baked for several hour-long cycles. The tape, designated EM 3887 Super High Temperature Crepe Masking Tape, combines a specially treated backing with a newly developed adhesive formulation which gives the tape resistance to high heat and long baking cycles, moisture and solvents. The tape will not stain metal surfaces to which it is applied. After baking, the tape strips off easily and cleanly.

It is recommended for use on specially treated metal surfaces, such as anodized or chromated aluminum and dichromated magnesium. Its extreme thinness and flexibility combine for less paint build-up along edges and easy application on curved or irregular surfaces.

High temperature resistance insures that the tape will adhere tightly to the surface without shrinking or curling while baking.

Drum Cradles and Racks

Pucel Enterprises, Inc., Dept. MF, 3746 Kelley Ave., Cleveland 14, Ohio.

All welded, tubular frames and channel braces give Grizzly cradles modern styling and added strength. Designed for rugged use, all edges rounded and smooth, assembled complete, they are ready for immediate use upon delivery.

Cradles are available with and without casters, with and without drum rollers. When requested, the cradles are furnished with 2 swivel and 2 rigid casters to enable easy and quick placement to exact location for instant use.

Rollers are for revolving drums for mixing, and draining alignment.

Cradles are 30" long, 18½" wide with various heights of 19, 25, 26½ and 27½". Shipping weight is 30 to 40 pounds. Special drum cradles are engineered for particular requirements on request.

Drum storage racks hold 4 or 6 drums in readily accessible positions, designed for loading ease from front or back. Self-standing units, do not require anchoring to floor, can be moved with fork trucks fully loaded, and are assembled complete, ready for immediate use upon delivery. Drain height from floor to spigot — bottom row 18", top row 48".

There are 2 models — No. DS-4, 60" wide x 36" deep x 46" high; No. DS-6, 84" wide x 36" deep x 46" high. Shipping weight is 120 to 200 pounds. DS-4 holds 4 drums; DS-6 holds 6 drums.

In-the-Tank Filter

Belke Mfg. Co., Dept. MF, 946 N. Cicero Ave., Chicago 51, Ill.

The complete In-the-Tank filter assembly includes the filter unit, motor driven pump, and discharge hose. The filter unit hangs on the tank wall right in the plating solution.

The motor driven pump, rated at 300 gallons per hour, draws the plating solution through the filter unit and returns clarified solution to the plating tank. As many filter units may be used as required to provide the needed capacity. The filters are easily moved from tank to tank.

The standard filter bag is paper, which requires no pre-coat or filter aid for most solutions. To clean, the paper filter bag is merely removed and replaced with a new one.

Filter bags of Dynel, Vinyon, Nylon or cotton twill can be furnished. To pre-coat these or the paper bags with filter aid or carbon, the pre-coat materials are mixed with water in any available drum. Operating the filter in the mixture pre-coats the filter bag; then filter unit and discharge hose are transferred to the plating tank without stopping the pump. To clean, the filter unit is washed in another drum or set in a drain and the old cake flushed off with hose. The filters can be furnished for all types of acid or alkaline plating solutions.

Organic Finishes

The P. D. George Co., Dept. MF, 5200 No. Second St., St. Louis, Mo.

Two new finishes have been made available by the above manufacturer. Reverse hammer finish is extremely uniform in pattern, has great depth and definition, and the pattern does not wipe out when overspray is encountered on irregular shaped hard-to-paint objects. Finishes in a wide range of colors, including darker colors, are made possible with the newly developed finish. Ease of handling and application is one of the outstanding features. Pieces may be sprayed during different phases of production by different operators, yet retain clear uniform patterns. The finish is available in bake or air dry. The air dry version is exceptionally fast drying.

"3-D" paint is simple to handle and apply. Sharply defined two-tone effects in splatter patterns can be obtained with any conventional type spray gun. Use of a veiling gun is recommended for the first coat, but the second coat can be applied with a conventional gun. Loss of time is eliminated since the second coat may be applied before the first coat dries. Patterns range from embossed leather appearance to excel-

Hammond OF KALAMAZOO

REVERSING EXTRUSION FINISHER

for LOW COST, VOLUME PRODUCTION FINISHING OF EXTRUSIONS, TRIM AND MOULDINGS

The Hammond Reversing Extrusion Finisher is the modern method for finishing extrusions, trim, and mouldings.

Production is increased . . . uniform finishing is assured . . . labor costs will be reduced, when hand operated machines and methods are replaced with this modern finisher.

Two-Head Machine shown . . . any number of heads, and length of conveyor, can be supplied to suit your job.

SEND SAMPLES and we will show you how much you can speed up production and cut costs.

Hammond Machinery Builders Inc.

1601 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

NO BETTER Degreasing Solvent CAN BE HAD

BLACOSOLV®

THE SOLVENT WITH THE ORIGINAL NEUTRAL STABILIZER

No other degreasing solvent made has greater resistance to heat, air, light. Blacosolv is most gentle, won't stain or etch the most highly polished metal surfaces...It stands up under the action of aluminum and has a greater capacity for absorbing acids, oils and coolants. Blacosolv maintains its stability after repeated distillation. By comparison, Blacosolv is the most economical solvent you can buy.

Write for Complete information on Blacosolv Degreasing Solvent and Blakeslee Degreasers. DEPT.103-C

G. S. BLAKESLEE & CO. 1844 S. Laramie Ave., Chicago 50, Ill. NEW YORK • LOS ANGELES • TORONTO
also Manufacturers of Blakeslee Metal Washing and Surface Treatment Machines

Our Engineering Trained Representatives Are Available to Help You With Your Cleaning Problems

lent reproduction of terrazzo pattern. When used as one color system, the finish closely resembles that of Fibreglas. The paint is available in almost any type vehicle commonly used in the manufacture of protective coatings.

Booster Vacuum Pumps

F. J. Stokes Corp., Dept. MF, 5500 *Tabor Road, Philadelphia* 20, *Pa.*

A new series of mechanical booster vacuum pumps operate at faster pumping speeds in the pressure range from 10 microns to 1 millimeter than comparable units offered by other manufacturers, and are thus capable of handling large volume pumping loads in this range more economically than other equipment, it is claimed.

The first four models in the new series pumps, Models 1710, 1711, 1712, and 1713, have maximum pumping speeds of 1050, 1250, 2900, and 5100 c.f.m. respectively and an ultimate vacuum of ½ micron. Larger units, with capacities up to 10,000 c.f.m., are currently under development, according to the company.

Chromium Plating Process

Service Hard-Chromium Co., Dept. MF, Route 22, *Union, N. J.*

The Chrom-Lume process, a completely new method for plating chromium directly to aluminum and its alloys presently available to industry in the New York-New Jersey metropolitan area, is unique in that it provides for direct coating of chromium to the basis metal with no intermediate metallic deposition of copper, nickel or zincate needed. Affording a strong adherent bond between the two metals, the process is claimed to eliminate the possibility of galvanic action and also prevents undesirable electrolytic couples.

Fabricated PVC Pipe Fittings

S. & C. Mfg. Co., Dept. MF, 6245 *Wiehe Road, Cincinnati* 13, *Ohio.*

A new line of super heavy duty fabricated PVC pipe fittings incorporate an original method of "beefing up" the butt-welded joints with continuous bands of PVC. The new banding method provides a greatly increased safety factor over the conventional butt-welded type fittings in all sizes of fabricated fittings. This highly increas-

ed safety factor of the new fittings should eliminate hesitancy on the part of designers and engineers to specify larger diameters in PVC piping systems.

The new SHD fittings are available in a wide variety of sizes and include all types of standard fittings such as elbows, tees, connectors, and adapters, with flanged, belled, and all victaulic connections.

BUSINESS ITEMS

Tranter Names Delaney

Appointment of *Gerald F. Delaney* to the *Platecoil Division* was recently announced by *Tranter Mfg., Inc.,* of Lansing, Mich. He will be at the firm's main offices in Lansing where he will concentrate on application engineering and pricing.

Mr. Delaney was graduated from Cornell University in 1955 with a degree in Mechanical Engineering. He took the power option in his studies with special emphasis on heat trans-

Gerald F. Delaney

fer. Before joining Tranter, he was employed by the Martin Co. in Baltimore, Md., and the Chrysler Corp., in Detroit, Mich.

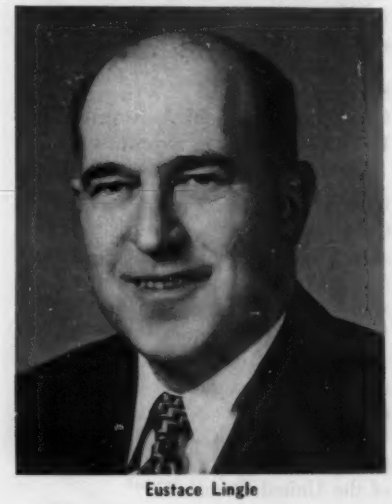
Howe Named Sales Manager by Industrial Finishes Co.

John F. Howe, Jr., formerly of the industrial sales department of the Sherwin-Williams Co., has been named sales manager of *Industrial Finishes Co.*, Philadelphia, Pa. He will supervise the activities of an expanding sales force in the Philadelphia territory, also the work of agents throughout the country.

Howe is the son of John F. Howe, president of the company. He is a graduate of Temple University and served as a sergeant in the Air Corps during the Korean War.

Oakite Names Lingle Vice President

Eustace Lingle, of 345 Crest Road, Ridgewood, has been named vice president in charge of industrial sales and education for *Oakite Products, Inc.*, manufacturers of industrial cleaning and metal treating compounds.



Eustace Lingle

Mr. Lingle joined the firm in 1929. After serving in several positions in the sales department, he was elected to the board of directors in 1939, and named vice president in 1953. He has now been given additional responsibilities in sales, sales planning, and technical education.

Rosander Named Manager of Sales Engineering at Chromalloy

Chromalloy Corp., White Plains, N. Y., has announced the appointment of *Richard T. Rosander* as manager of sales engineering. *D. E. Lehane*, who held this position, has been made director of customer relations.

Mr. Rosander, who holds a degree in mechanical engineering from the University of Illinois, comes to the company from Fairbanks, Morse & Co., where he served as New York district manager. During World War II he was on active duty with the U. S. Navy as a Lieutenant Commander. Prior to that he was affiliated with the Electro-Motive Division of General Motors Corp.

Detrex Adds H. G. Bixby To Board

H. G. Bixby, president of Ex-Cell-O

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PIONEER MANUFACTURERS OF AUTOMATIC POLISHING AND BUFFING MACHINES

H. G. Bixby

Corp., has accepted an appointment to the board of directors of *Detrex Chemical Industries, Inc.*

Saubestre Joins Enthone

Edward B. Saubestre has joined *Enthone, Inc.* of New Haven, Conn., as assistant to the research director. He will assist *Dr. Walter R. Meyer*, president and research director, in expanding the firm's research and development program.

Dr. Saubestre graduated from Columbia University in 1945 with a BS degree in chemical engineering. After serving in the U. S. Army, he returned to Columbia and received a PhD degree in 1952. While at Columbia, he worked with *Dr. H. B. Linford* on A.E.S. Research Project No. 12, "Cleaning and Preparation of Metals for Electroplating." He then became

Edward B. Saubestre

associated with the Research Laboratories Division of Sylvania Electric Products, Inc., Bayside, N. Y., where he specialized in electrochemical research. He has been granted two patents on electropolishing and has fourteen patents pending.

A recognized authority on metal finishing and electrochemistry, Dr. Saubestre has authored numerous technical papers on a variety of subjects and has lectured extensively. He has served on ASTM committees B-8, D-12 and E-12 and Electronic Industries Association's committees 37C (Soldering) and 40C (Printed Circuits). Presently serving as president of the New York Branch, AES, he is also on the executive board of the Electrochemical Society, Metropolitan Section. Additionally, he is a member of ACS, ASM, AAAS, Institute of Metal Finishing, Scientific Research Society of America and the New York Academy of Science.

Sharpe Mfg. and Campbell-Hausfeld Announce Reciprocal Arrangement

Joint announcement has been made by *Sharpe Mfg. Co.*, Los Angeles, Calif., and *Campbell-Hausfeld*, Harrison, Ohio, detailing a new reciprocal manufacturing, distribution, and sales arrangement between the two manufacturers of paint spray equipment.

Sharpe will handle distribution and sales for the combined lines in the eleven Western states plus Arkansas, Oklahoma, Kansas and Texas; Campbell-Hausfeld will distribute to the rest of the United States.

Schultz Appointed by Pangborn Corporation

Jack K. Schultz

The appointment of *Jack K. Schultz* as Philadelphia district manager has been announced by the *Pangborn Corp.*, Hagerstown, Md. In his new position, he will direct overall sales activities and field engineering services from the district headquarters at 806 West Ave., Jenkintown, Pa.

Mr. Schultz has spent 12 years in the firm's home office, planning commission and 11 years in sales engineering. He has been district sales engineer in Phialdelphia since 1951.

Oakite Promotes Seib and Steif

George M. Seib, formerly secretary of *Oakite Products, Inc.*, has been appointed vice president of the company, which manufactures industrial cleaning and metal treating compounds. *Erwin H. Steif*, who was Mr. Seib's assistant, has been promoted to the post of secretary.

With the firm since 1922, Mr. Seib has been a member of the board of directors since 1946, and has served as secretary since 1953. Mr. Steif, a graduate of Yale Law School, joined the company in 1948 as legal counsel, and has served on the board of directors since 1953.

George M. Seib

Erwin H. Steif

Raske Appointed President of Nu-Matic Grinders

Nu-Matic Grinders, Inc., 8224 Carnegie Ave., Cleveland 3, Ohio, has announced the appointment of *Arthur Raske, Jr.* to the position of president. Raske has served in the capacity of executive vice president for the past six years.

Product: 99.75+% Pure
Service: 100% Sure

Every batch checked. Every can filled with a full weight of extra high quality 99.75+% Chromic Acid. Prompt delivery from ample factory and nearby distributor stocks. Why not order BFC Chromic Acid next time?

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Cincinnati Cleaning & Finishing Machinery is used in the production of a wide range of Bruning equipment for drafting and copying, earning the user's commendation for savings, improved product and working conditions.

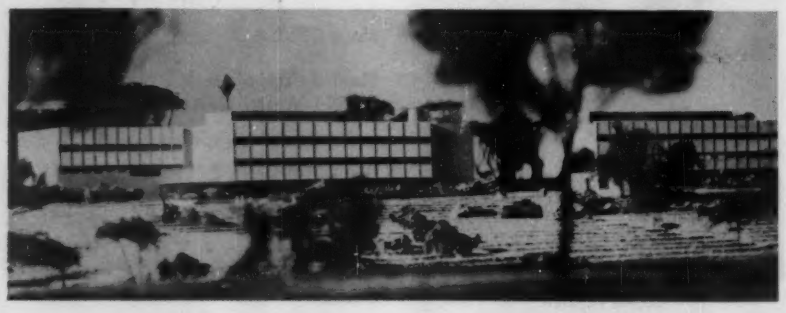
The monorail cleaning machine shown here processes frame parts and cabinets of copying machines prior to finishing; it is also used to clean machined parts between operations. The cleaning machine is part of a complete Cincinnati system which also includes: dry-off oven, down-draft spray booth, paint bake oven, monorail conveyor and air make-up unit.

Use the engineering and experimental facilities of Cincinnati Cleaning to get more economical cleaning and finishing . . . with better results . . . in your plant. For details, write: Cincinnati Cleaning & Finishing Machinery Co., 2027 Hageman St., Cincinnati 41, Ohio.

New Research Center Planned by Diamond Alkali

Campus-style research center announced by *Diamond Alkali Co.*, Cleveland, Ohio, producers of industrial and agricultural chemicals, will be located on an attractively landscaped 800-acre site in Concord Township, O., just a few miles south of company's Painesville plant and present research facilities at Fairport.

Shown here are models of central research buildings as visualized and designed by the architects, Giffels and Rossetti, Detroit, Mich.



New V.P. for Metal Finish, Inc.

Metal Finish, Inc., announces the

William H. Armstrong

election of *William H. Armstrong* to the position of vice-president and general manager of that New Jersey firm.

Mr. Armstrong has been in the barrel finishing field for over 15 years; prior to his new appointment, was sales manager for the Honite products of the Minnesota Mining and Mfg. Co.

Metal & Thermit Corp. Widens Development Activities

In order to place major emphasis on the planning and development of new products, *Metal & Thermit Corp.*, New York, has recently widened the scope of its development activities.

To be known as the development department, reporting direct to *H. E. Martin*, the company's president, this department is now not only responsible for market development and market research, but also for product development, a new technical activity being conducted at the research center in Rahway, New Jersey. *H. E. Hirschland*, former manager of market development has been named director, and *C. H. Carpenter*, formerly technical advisor to the president, is manager.

Interchemical Appoints New Eastern District Manager

Kenneth J. Carson has been named vice-president and Atlantic District manager of *Interchemical Corp.'s Finishes Division.* He has been with the

firm since 1945. From selling finishes in the Cleveland area, he moved up to assistant district sales manager, district sales manager and finally to assistant manager, Atlantic District. Mr. Carson will have full responsibility for

Kenneth J. Carson

administration, sales and production on the Eastern seaboard.

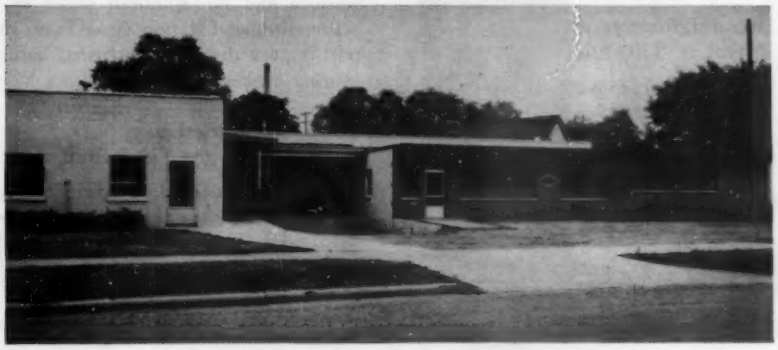
Mr. Carson graduated from St. Benedict's Prep School and has a B.S. and M.S. in Chemistry from St. Peter's College in Jersey City, where he was also an instructor in chemistry.

Abrado Finish Expands

The Abrado Finish Corp., formerly the Grand Rapids Tumbling Supply Corp., has just completed the addition of over 10,000 square feet of new offices, experimental laboratories, and manufacturing facilities to their plant located at 1750 Elizabeth Ave., N.W., Grand Rapids, Mich.

C. Heamon Castle, well-known barrel finishing authority, is associated with the company as executive vice-president and technical director. Mr. Castle's background includes that of technical director for another well-known supplier of barrel finishing materials, and he has devoted the last 25 years to process development for the metal finishing trade. He graduated from Michigan College of Mines and Technology with a degree in Metallurgical Engineering and has written several technical papers on barrel finishing published in national magazines.

The technical laboratory is well equipped with the latest testing equipment. In addition, the firm has available modern, up-to-date facilities for demonstrations and for solving a wide variety of metal finishing problems.



Grieve-Hendry Appoints Calabrese

P. J. Calabrese has been appointed sales manager of *Grieve-Hendry Co., Inc.*, Chicago, manufacturers of industrial and laboratory ovens and furnaces. He was formerly regional sales manager for Chamer Controls Corp., and prior to that time industrial mar-

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Today in the light of ever increasing costs, Atlas offers you economical pickle tank construction that will give you longer trouble free life. This is accomplished by the use of a mild steel or concrete shell protected by corrosion-proof linings and acid-brick sheathing joined with corrosion-proof cements. These Atlas tanks are impervious to today's stronger pickling solutions and higher operating temperatures. A wide choice of cements is available, each best suited for a specific condition.

Atlas construction is far less costly to install than expensive alloys. In addition Atlas tanks are corrosion-proof inside and out and are engineered to withstand hard physical abuse from shifting loads.

For a lower initial cost, longer life expectancy and complete protection against corrosion, see Atlas first.

Write for Atlas Bulletins 5-2 and C-1.

ATLAS MINERAL
MERTZTOWN, PENNSYLVANIA

P. J. Calabrese

ket specialist for Minneapolis-Honeywell Regulator Co. He has had broad experience in industrial market research and the estabilshment and training of industrial salesmen and sales representatives.

He was an honor graduate in Mechanical Engineering at the University of Illinois, and did post-graduate work in various science and administrative fields.

Hargarten Appointed Service Manager by Du Pont

Jerome J. Hargarten has been appointed service manager of the *Chlorine Products Division* for the *Du Pont Company's* Electrochemicals Department. He will direct activities of solvents technical representatives and will coordinate metal cleaning work in the field and at the new sales technical laboratory at Chestnut Run.

Mr. Hargarten joined the firm in 1950 as a development engineer. He has held various technical positions, including technical service representative for chlorine products in the Detroit area. In his new post he succeeds *Frederick G. Low*, recently appointed product manager for lysine.

Re-assignments at Metal & Thermit

Metal & Thermit Corp., New York, announces the following re-assignments of sales personnel:

R. T. Gore, formerly a member of the development staff has been appointed sales engineer and will specialize in introducing new products to electroplating plants and shops in the northeastern states.

W. W. Brodin, sales engineer, previously connected with the Rahway, N. J., office, has been transferred to the company's East Central regional office and will serve plating and coating accounts in the Detroit-Toledo area.

Chas. Fazekas, formerly an organic coating service engineer for the company, has been appointed sales engineer in the northeastern region.

Hahn Named Manager of Stokes' Rochester Sales Office

F. Theodor Hahn, who has been a field sales engineer for the company in upstate New York for the past year and a half, has been appointed manager of the Rochester sales office for *F. J. Stokes Corp.*, Philadelphia. The Rochester office is located at 7 Bobrich Drive, Rochester 10, N. Y. Telephone number is HUbbard 2-2011.

F. Theodor Hahn

Mr. Hahn was born and educated in Germany. For the eight years prior to 1954, when he came to this country, he was associated with V.D.M. in Frankfurt, a large manufacturer of non-ferrous metals and also one of the largest custom-molders of thermoplastics in Europe. In America, Ted traveled extensively throughout the eastern, midwestern and mid-southern states as a representative for two New York export-import distributing firms, before joining Stokes early in 1957.

Siwik Appointed to U. S. Stoneware Sales Staff

U. S. Stoneware Co., Akron, Ohio, has announced the addition of *James G. Siwik* to their sales group. He will have his headquarters in the company's New York offices at 60 E. 42nd St.

Siwik has a background of varied

James G. Siwik

experience in process development, production, and sale of products in the chemical field. He was previously sales engineer with the General Electric Co., handling sales of specialty chemicals to industry in several of the Eastern states. He has also served as an engineer with the Atomic Energy Commission where he was associated with the processing and supervision of fissionable material for use at research facilities.

During a tour of active military duty in the Ordnance Corps, U. S. Army, Siwik was assigned as a project engineer responsible for planning and conducting studies on the manufacture of solid propellants and high explosives.

Siwik received his degree in Chemical Engineering at the Cooper Union School of Engineering in 1952.

DeBaker Added to Milwaukee Office of American Air Filter

Glenn M. DeBaker has joined the Milwaukee branch sales office of the *American Air Filter Co., Inc.*, as a sales engineer. He is a graduate of the Milwaukee School of Engineering and was formerly connected with the Milwaukee consulting engineering firm of Lofte & Fredericksen.

Two Engineers Engaged by Branson

Elliott Henry and *Brett Hollerith* have joined *Branson Ultrasonic Corp.*, Stamford, Conn., manufacturers of ultrasonic gaging and cleaning equipment.

Mr. Henry has been named senior development engineer. In his past association with Sperry Products, Inc., Maguire Industries, and Radio Corp. of America, he has been responsible for a number of ultrasonic "firsts." He holds several patents in the ultrasonic /electronic field. Mr. Henry is a member of The Acoustical Society of America, The Institute of Radio Engineers, and the Society for Nondestructive Testing.

Mr. Hollerith, an applications engineer, has been associated with the Liston Becker Plant of Beckman Instruments, Inc., Stamford, Conn. He is a graduate of Princeton University (B.S. Ch.E.).

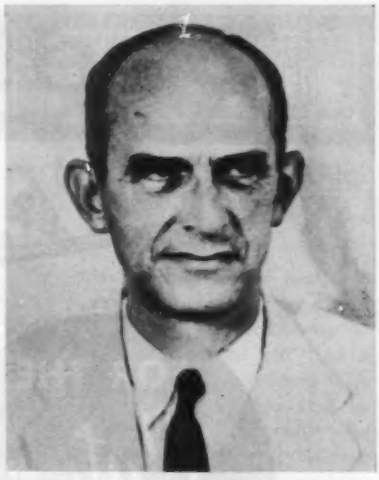
H-VW-M Reorganizes R&D Group

A reorganized group has begun operations in the new electrochemical laboratory of *Hanson-Van Winkle-Munning Co.* The following organizational changes and staff additions are effective with occupation of the new laboratory.

Dr. Otto Kardos

Dr. Otto Kardos, named senior scientist, will concentrate his interest on electroplating processes. Dr. Kardos received his Ph.D. at the University of Vienna and stayed on in Austria as an electrochemist. He joined the firm 14 years ago after serving for four years as an electroplating consultant in France. He was appointed chief research electrochemist several years ago.

William B. Stoddard, Jr. becomes assistant manager of electrochemical research. Mr. Stoddard was graduated from the University of Colorado in 1929 with a degree in chemistry. He has since worked in the plating field and in the general area of chemical engineering both in the U. S. and in Europe.



Wm. B. Stoddard, Jr.

Eugene A. Roche was appointed re-

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PLATING RACKS
RUBBER DRUM LINERS
ACID CONTAINERS
ANODE HOOKS
FIBERGLAS TANKS
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PLASTIC COATED DIPPERS & PAILS
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LIGHTWEIGHT • LONG LASTING • STURDY

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. . . Non-Breakable Cylindrical and Rectangular — External Flange Tanks —Molded in One Piece . . . without seams

• Will Not Bulge When Filled • Do Not Get Brittle with Age • Safer for Employees • Cheaper Than Stainless Steel Tanks or Rubber Lined Drums

Can safely be used with the following solutions at a temperature of 122° F. . . . .
ACIDS: Acetic 10%, Chromic 10%, Hydrochloric 36%, Hydrofluoric 50%, Nitric 10%, and Sulfuric 20% . . .
Sodium Hydroxide 50% . . . Hydrogen Peroxide 30%

Cylindrical Tanks — External Curled Cuff Flange — Straight Sides

Stock No.	Gal.	Out. Dia.	Height	Remarks	Price
CK1522	15	15 ins.	22 ins.	Support	$18.50
CK1828	30	18 ins.	28 ins.	Support	23.75
CK2233	55	22¼ ins.	34½ ins.	Support	26.00

Cylindrical Tanks will fit as inserts into standard 15, 30 and 55 gallon steel drums . . .

Rectangular Tanks—External Flange—Straight Sides—Heavy Wall

Stock No.	Gal.	Length	Width	Height	Remarks	Price
RX191936	52	18½ ins.	18½ ins.	35¾ ins.	Support	$111.75
RX231536	52	22¾ ins.	14¾ ins.	35½ ins.	Support	111.75
RX481523	68	47½ ins.	14½ ins.	23 ins.	Support	119.25
RX262836	101	25½ ins.	25½ ins.	35½ ins.	Support	131.25
RX471829	104	47 ins.	17½ ins.	29¼ ins.	Support	150.00

PLATING PRODUCTS, Inc.

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Redline

FABRIC ENGINEERED by *Milliken*

FOR THE *Cut* IN 'CUT and COLOR' WORK

"Redline" is another new cloth developed through Milliken Research. With different fabric properties, it is a good alternate to "Type 190". Redline has proved itself in regular production usage. Check its buff cost/performance ratio in your shop under your conditions.

Redline is a trademarked fabric . . . as are the other three fabrics that make up the present line of Milliken "Fabrics Engineered for Buffs". Because each of these fabrics has different buffing characteristics, we suggest that you try out *all four*. Ask your buff supplier to make up a test lot of buffs in the styles and sizes you use. You will know you are getting a premium quality fabric because the trademark appears in the plies of each section.

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Eugene A. Roche

search chemist. Mr. Roche took the bachelor of arts and, in 1950, the bachelor of science in chemical engineering degrees at Johns Hopkins University. He came to HVWM from American Chemical Paint Co. and, prior to that association, was an employee of Mutual Chemical Co.

Beckman Instruments Announces Appointments

Beckman Instruments, Inc. has announced the appointment of *Max D. Liston* as director of engineering, *Thomas V. Parke*, director of product standards, and *Earl C. Janson*, director of manufacturing, to serve on an enlarged corporate staff.

Liston founded the Liston-Becker Instrument Co. of Stamford, Conn., and served as manager of the facility after it was acquired by Beckman in 1955. A recognized authority in the field of infrared analytical instrumentation, he holds approximately 30 patents for his inventions.

Liston received his bachelor's degree in electrical engineering from the University of Minnesota and was graduated magna cum laude. He also holds a master's degree in mechanical engineering.

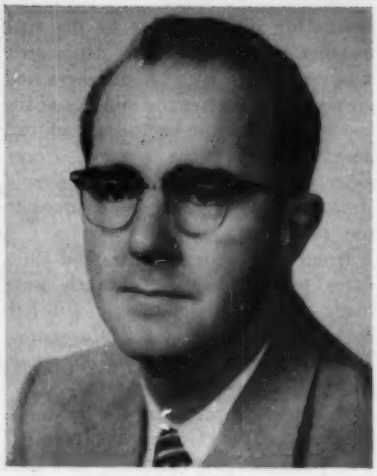
Parke, whose new corporate post includes responsibility for product standards and service, formerly served as manager of the Scientific Instruments Division. He joined the company in 1956 as manager of laboratory instrument research and engineering after 16 years with Eli Lilly Co. where he was engaged in instrument development, instrument application, and research administration. A chemistry graduate of Purdue University, Parke also studied at the University of Munich.

Janson joined the firm in 1953 as manager of the company's headquarters plant. Earlier he held manufacturing administrative posts with Librascope, Inc., American Can Co., Bendix Aviation, and the U. S. Naval Ordnance Plant, Chicago. Janson completed studies in mechanical engineering at the University of Wisconsin, in business administration at Northwestern University, and took graduate work in business administration at the University of California at Los Angeles.

Nankervis Promotes Pair

George L. Nankervis Co., Detroit manufacturers and distributors of metal finishing supplies and equipment,

Ward J. Beachamp



Kenneth J. Battjes

has announced the appointment of *Ward J. Beauchamp*, treasurer and *Kenneth J. Battjes*, secretary.

Beauchamp has been with Peninsular Metal Products Corp., parent company of Nankervis, for fifteen years as secretary-treasurer and continues to maintain this office in addition to his new position.

Battjes has been with the firm since 1950 and is manager of public and employee relations for the company.

Du Pont to Build Plant in Belgium

A plant to manufacture Du Pont paint products will be built in Belgium, it was announced recently. The plant will be operated by *Du Pont de Nemours (Belgium) S.A.*, which will be formed in the near future as a subsidiary of *E. I. du Pont de Nemours and Co., Inc.*, of Wilmington, Del.

Stuart L. Finch, who has had more than 20 years' experience in the firm's paint manufacturing operations, is proceeding to Belgium and will become manager of the production facilities. The plant's products will include lacquers, enamels, paints, varnishes and thinners for the automotive, automotive refinish, industrial, and household and maintenance fields.

The plant will be located at Malines, Belgium, 12 miles north of Brussels, on a 17-acre site which is being purchased from the city. Construction is scheduled to get under way about the first of the year and the plant is to be ready for operations in the fall of 1959. The plant will provide jobs for about 100 people, who will be hired locally.

The new facilities will consist of manufacturing and warehouse buildings, an office building and laboratory facilities. They will be of brick and concrete construction.

Techline Appoints Sales Representatives

Appointment of sales representatives has been announced by the *Techline Division, Wheelabrator Corp.* The representatives are *Charles William Thomas*, Arcadia, Calif., *Richard Dale Taylor*, Phoenix, N. Y., *Ruel K. Shumway*, St. Louis, Mo., *Donald H. Schultz*, Elm Grove, Wisc., and the *Industrial Sales and Engineering Co., Inc.*, Kalamazoo, Mich.

A graduate of Pasadena City College, Thomas is a long-time California resident and has more than seven years of experience in industrial sales work in the Los Angeles area. His territory includes the entire state of California.

Taylor has more than six years of experience in selling barrel finishing equipment and supplies in New York and Pennsylvania in addition to experience as a process technician for a barrel finishing equipment manufacturer. He is a member of the A.E.S. His territory includes the majority of the state of New York, plus 13 counties in Pennsylvania.

Shumway has approximately 25 years of experience in the plating and anodizing field and since 1952 has sold electroplating supplies and equipment. He is a member of the A.E.S. and the A.S.M. His territory includes Missouri, Kansas, Arkansas, Oklahoma and three counties in southwestern Illinois.

For the last twelve years, Mr. Schultz has operated the Eldon Co., Milwaukee, in the distribution of barrel finishing equipment, supplies and associated items. He will continue this arrangement providing complete service, equipment and supplies throughout the states of Wisconsin, Minnesota and Winnebago and Boone Counties in Illinois. Schultz also is a member of the A.E.S.

The lower peninsula of Michigan will be covered by the Industrial Sales and Engineering Co., Inc. *Clarence A. Elzinga*, president of the ten-year old firm, is a member of the American Society of Tool Engineers and the American Society for Metals. Salesmen who will handle the complete line throughout Michigan are *Keith L. D. Foster*, vice president, and *Floyd M. Bevans, Ronald Warren, Charles N. Albrecht, James Souers* and *Williams F. Burton*.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Newark Branch

The first meeting of the year was called to order on Sept. 19 by President *G. Bittrich* with 102 members present. *John Banta* pointed out that a membership blank was enclosed with the last Newark Sparks and said he looked forward to a good growth year due to the Organic Finishing Section and the drive on shops as yet not having members. A placard to be sent to job shops in September was passed out for distribution. *John Kosmos* reported 3 meetings of the By-Law Committee and that progress had been made. Mr. Bittrich stated plans were already laid for the Christmas Party.

Al Korbelak urged all members to write to their Senators and Congressmen re the A.E.S. Commemorative Stamp and distributed sample letters as a guide. Six applications were accepted. Mr. Bittrich announced that an electroplating school would be held this year and urged registration as soon as possible. He also reported that a prize would be awarded each year for the best Timely Topic. He appointed Korbelak chairman of the prize committee and Messrs. *DuFosse, LaManna, Irenas* and *Latawiec* members.

Librarian Korbelak opened the Educational Session by welcoming the many organic finishing people present and introduced Mr. Sholtz, Interchemical Corporation, who presented a Timely Topic on flow coating. *Dr. Sam Spring* of the Kelite Corp., Los Angeles, then discussed "Cleaning and Etching Aluminum." The branch gave both speakers a rising vote of thanks and adjourned to enjoy a period of refreshments.

D. Gardner Foulke
Secretary

Indianapolis Branch

On September 8th, 40 members and guests started the 1958-59 year with a dinner meeting at Fox's Steak House. After the dinner, and the introduction of members and guests, *Bert Hawhee*, branch president for the past year, introduced the new officers and board of managers and thanked the outgoing officers and members for their cooper-

ation in the past year. He then turned the gavel to *John Hood*, the president for the coming year. The meeting was turned to *Paul Johnson*, branch librarian, who introduced *Dr. Henry Brown* of the Udylite Research Corp., who spoke about "Corrosion Studies on Chromium Plate." The talk was well received and several questions were answered by Dr. Brown.

Applications for membership were submitted for *Larry Joe Bell* and *Gilbert G. Skinner*. It was moved and seconded that they be accepted. The motion passed.

A Past Presidents' Pin was presented to *Bert Hawhee* by Mr. Hood.

Addison Howard of the Paper Committee for last year, asked the wishes of the branch in regard to publishing of the paper which had been presented at the May meeting. *John Holland* moved and *Bert Hawhee* seconded that the paper be presented as a branch paper for publication. The motion was passed.

Les Reynolds reported on the activity of the national membership committee. He requested that the branch secretary should get new application forms from the executive secretary.

Mr. Holland made a motion, seconded by Mr. Hawhee, that *Dr. Abraham Max* and *Tom Evans* be nominated again for the Society Scientific Achievement Award. The motion was passed.

A. M. Howard
Secretary

Buffalo Branch

The branch held its first meeting of the new season Friday, September 5, at the Niagara Manor, 899 Niagara Falls Blvd., Buffalo, N. Y. After an enjoyable dinner and business session, *John Donaldson*, librarian, introduced *Kenneth P. Bellinger* of the Conversion Chemical Corp., who spoke on "The History of Modern Trends in Chromating." Mr. Bellinger outlined the history of chromate coatings from their inception to the present day, discussing in detail the various metals that lend themselves to the conversion coating process, followed by slides and samples illustrating the interesting facets of chromate films.

The November meeting will also be held at the Niagara Manor, on Friday, November 7. The speaker will be *Robert T. Gore* of Metal & Thermit Corp., whose subject will be "Wire Plating."

The annual Christmas Party will be held Saturday, December 20, at the Niagara Manor.

An early reminder that Buffalo is host to the 5th Empire State Regional Meeting which will be held April 11, 1959 at the Hotel Stuyvesant in Buffalo.

It is with regret we announce the passing of *Willis M. Fotheringham*, known as "Bill" to all his friends. A member of the Buffalo branch for 20 years, he held the offices of vice president & librarian and served faithfully on numerous committees.

Robert E. Lienert
Secretary

British Columbia Branch

The members met at 6 P.M. on September 12th at the White Spot Dining Room for dinner, prior to the first meeting of the Fall session. Attendance was very good, with 28 members and guests present. After the minutes of the last general meeting had been read, two new members were elected. *Harry Smeets* of Vernon, B. C., and *Gerald Amos* of Vancouver were welcomed to our ranks.

Nominations for delegates and alternates to represent the branch were made as follows: Delegates — *Bill Kilby, Jim Hurford* and *Bill Marquardt*. The alternates were: *Ralph Wolloschuk, Nelson Shepherd* and *Jim Lee*.

A proposed program for acknowledgement of the "Golden Anniversary" was presented by President *Jim Lee*. Everyone was in agreement on this subject and the plans remain only to be finalized in the very near future.

The main part of the meeting was devoted to a discussion by all members of problems concerning attendance and general policy in the coming year. Each individual had the opportunity to air his views and it was a lively session indeed. A committee was formed to study the suggestions made throughout the evening and to present their recommendations at the next general meeting. The committee men elected were: *Ralph Wolloschuk, Doug Armstrong, Claus Schlossareck* and *Bill Cragg*.

A program committee was elected, consisting of *Jim Hurford, Hugh Roberts, Bill Marquardt* and *Jack Stoneberg*.

N. A. Shepherd
Secretary

Chicago Branch

The first meeting of the 1958-1959 season was held on Friday, Sept. 5, at the Western Society of Engineers. The branch has made a change, in having the business meeting precede the technical session, in order to have a more active participation of the members present. The branch was honored by the presence of *Ralph D. Wysong*, Studebaker-Packard Corp., who serves as National first vice-president of the Society.

The technical session of the evening was a "Panel Discussion on Organic Finishes," and Librarian, *Joseph C. Corre* introduced the speakers for the evening. The first speaker was *Vince Greci*, technical director, The Clinton Co., whose subject was "The Various Resins used in Organic Coatings." Mr. Greci classified the materials used in lacquer formulation into two types (1)

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natural resins and (2) synthetic type and discussed both.

The second speaker was *Rudy Hazucha*, of the same company, who spoke on "What Type of Finish to Specify for Specific Applications."

The last speaker was *Charles Berry*, Maas and Waldstein, who spoke on "The Application of Various Types of Organic Coatings." Mr. Berry discussed, briefly, the methods of applying organic coatings to materials. The talks were very well received by the members as a very lively question and answer period followed.

Christopher Marzano
Publicity Chairman

Waterbury Branch

The September meeting was held at the Roger Smith Hotel on Thursday, the 11th. A short business meeting was called to order by President *Ed Garland*. The sentiment of the group was taken on a proposed golf outing, and a possible alternative social function for the Christmas Party. Nominations were made by the nominating committee for the National Convention delegates.

Mr. Garland introduced *Frank Eddy*, who made a formal presentation of a silver gavel to another of our past national presidents, *Ellsworth Candee*. Mr. Candee held office in 1942 prior to the introduction of the custom of giving silver gavels to retiring presidents. He was most appreciative of the gift and promised it a conspicuous resting place.

The speaker of the evening was *John F. Tufel*, Waterbury manager of Laird, Bissell & Meeds. His subject was "The ABC's of Investing." A short film was shown concerning the Stock Exchange, entitled "What Makes Us Tick," followed by the talk and discussion. The talk was extremely well received and the questions were extensive.

The meeting was adjourned and refreshments were served.

F. A. Schneiders

Blue Ridge Branch

The branch held its September meeting Friday, the 5th at 6:30 at the Virginia Polytechnic Institute picnic area in Blacksburg, Va. Twenty-five members and guests were present. After the picnic the meeting was moved to nearby Chemical Engineering building where business and program were conducted.

President *T. R. Boggess* presiding, the meeting was opened with the by-laws at the Dixie Region AES ratified by a majority vote. A central meeting place was discussed and it was agreed that next meeting would be held in Martinsville, Va., October 3rd unless other arrangements had been made.

Art Pierdon from Baltimore-Washington Branch introduced *Ken Huston* as the speaker. Mr. Huston is senior corrosion engineer for Armco Steel Corp. and has specialized in surface finishes for stainless steels since 1946.

All types of stainless steels and their alloy components were discussed. Photographic comparisons of corrosion at Kure Beach and other corrosion test areas were displayed. Scale removal and cleaning methods were discussed.

After answering the many questions of members Mr. Huston made available to the membership technical literature pertaining to stainless steels.

Carl Witherspoon
Secretary-Treasurer

Lancaster Branch

The regular meeting took place on Sept. 12th at the City Line Diner, Harrisburg, Pa., with 28 members and 5 guests present. During the business meeting *Joe Shocker* gave a report on revisions and changes to the existing By-Laws. Changes were approved.

The following delegates were elected to the National Convention:

Delegates, *E. Biemiller, B. Klunk, R. Playsted.*

Alternates, *C. Smith, Geo. Lafever, J. Shocker.*

One application for membership was received, from *Martin Frandt*. Three resignations were also received, *Miss Marian Myers, Harvey Reynolds*, and *John Reynolds*.

The educational program consisted of an excellent talk on anodizing of aluminum by the very capable *Elliot Gessman* from Olin Mathieson Chemical Corp. of New Haven, Conn.

I. Paul Sharretts
Secretary

Los Angeles Branch

Los Angeles Branch opened its Fall meeting program at Rodger Young Auditorium, Los Angeles, on the night of September 10 with an attendance of approximately 80 members and guests.

The business session was highlighted by a spirited discussion on proposals to revise election procedure with the aim of achieving more effective screening of candidates for branch office. This discussion had been precipitated at a spring meeting by a number of members who felt that a more liberal method of nominating candidates from the floor should be adopted instead of accepting the complete slate of candidates recommended by the nominating committee.

The subject was studied during the summer recess period by a special committee composed of *Don Bedwell* (chairman), *Mrs. Vonna Ott, Leo Missel, Earl Coffin* and *Claude C. Weekly*.

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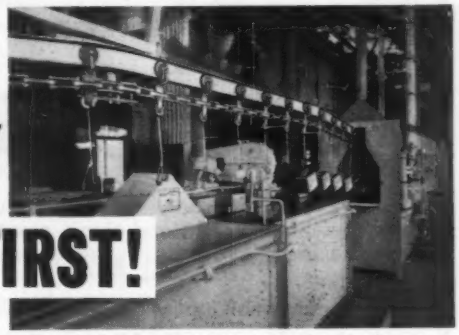

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Represented on the committee were members who favored retention of existing election procedures as well as members who felt revisions were in order.

Discussion at the September 11 meeting centered on the recommendations incorporated in the report, which stated that, after a thorough reevaluation of election procedures, the committee recommended that the election requirements as set forth in the by-laws be observed in the main, with certain broadening of their scope.

The committee recommended that a box be made available in the meeting hall at least three months in advance of the annual election in March, into which members could drop the names of nominees for office. All persons so nominated would be given a thorough screening by the nominating committee (a) as to their qualifications to hold office; and (b) as to their willingness to accept office if elected.

The committee pointed out that, in too many instances in the past a proposed candidate did not disclose his unwillingness to run until election night, making it necessary to nominate substitute candidates from the floor on a moment's notice. By screening all candidates several months in advance, and ascertaining their willingness to run, the committee pointed out, an adequate slate of qualified candidates could be arrived at.

The report was accepted by the membership, with the stipulation, as stressed by Branch President *Norman McEwan*, that the committee would serve only in an advisory capacity to the nominating committee by assisting it in screening candidates. McEwan emphasized that the nominating committee would continue to submit a slate of candidates, to which names could be added by nomination from the floor on election night.

Larry Benecit, general chairman of the branch's 1959 Educational Session, reported that March 21 had been selected as the date and the Beverly Hilton Hotel as the site. In compliance with Supreme Society policy, the A.E.S. Golden Anniversary theme will be stressed at the branch's educational session. Some committee appointments were also announced by Henderson: *Harvey Hunt*, educational chairman; *William Thomas*, dinner chairman; *Don Bedwell*, tickets and publicity; *Hal Wanamaker*, reservations.

A deviation from past policy has been agreed upon to the end that the wide variety of approximately 300 door prizes, which manufacturers were requested to donate in past years, will be foregone in 1959 in favor of about a dozen high quality prizes. The entertainment program, Henderson announced, will be featured by a 1½ hour Ice Show.

David Seymour, chairman of the handbook committee, reported that excellent progress was being made; that most of the technical material for the book had been arranged for, and that it would be off the press before the 1959 Educational Session opens.

Stanley Golnik, *Paul Schlocker* and *Gerry Stocke* were initiated into membership by President McEwan.

The speaker of the evening was *Richard C. Barrett*, president, Barrett Chemical Products Co., Shelton, Conn. He discussed sulfamate plating solutions, including iron, cobalt, cadmium, and nickel. Mr. Barrett, a former resident of San Francisco, was instrumental in pioneering and developing sulfamate plating solutions and presented Los Angeles members with a complete review of recent developments.

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San Francisco Branch

On September the 11th at 8:30 P.M. the regular monthly meeting was called to order by President *Jack Hite*, who introduced the speaker for the evening, *"Mac" McDonald*. Mac, as usual, gave a very informative talk on "Control of the Plating Process." An interesting and lively question and answer period followed.

Alan Baker presented a film in sound and color covering a day of recreation for the delegates at the A.E.S. National Convention in Boston in 1941. There were many interesting "shots" of persons who are in the "Hall of Fame" of the A.E.S. *Dominick Maviglia* read an article published in 1919 written by *Henry Cavallero*, which described the working conditions and problems that faced the plater and polisher at that time. The article went on to point out the great work that *Jack Esposito* was doing to promote better conditions for those working in the plating trade. Mr. Esposito was present at this meeting and received an ovation from the members in honor of his contribution to the plating industry in the San Francisco Bay Area.

Guy Condrett, membership committee chairman, announced that *David Baker*, *Pat Masso*, and *Glen Pierce* had been accepted into the Society. The board of managers accepted the reinstatement of *Ben Weinstein* as a member.

The following members were nominated as delegates and alternates to the National Convention: *Dominick Maviglia*, *Guy Condrett*, *Al Lee*, *Fred Huntington*, *Jack Esposito*.

Guy Condrett announced that attendence at the regular meeting was improving and that attendance at this meeting was the highest so far this year. Guy also pointed out that we should continue to work for Sustaining Membership. He set 4 memberships as a temporary goal.

R. T. Coen
Secretary-Treasurer

Grand Rapids Branch

The first meeting of the 1958-1959 season was held September 12 at Scotties Restaurant. Forty-seven members turned out to enjoy the dinner of steak or shrimp. President *Paul A. Waalkes* started the meeting by announcing that the branch Ladies' Night would be held this year on October 11 at the Manger Hotel (formerly the Rowe). This annual affair has been very successful in past years and promises to be better than ever in 1958 under the excellent direction of Committee Chairman *Richard O. Watson*. Mr. Waalkes, on behalf of the branch, extended congratulations to *Chester G. Borlet* on his election as National third vice-president. "Chet" gratefully accepted the good wishes of the branch and promised great things from the national office this year.

The membership approved the election of the branch secretary as an automatic delegate to the national convention and agreed to underwrite his expenses for a one-day stay. The delegates for the 1959 national convention will be *Chester G. Borlet*, *Edwin J. Krook*, and *Donald Schantz*. Alternates are *John Dykstra*, *Donald R. Smith*, and *Richard O. Watson*.

President Waalkes announced the beginning of an intensified drive this season for new members. He asked the help of the membership to make the Golden Anniversary Year the best

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in A.E.S. history. Three new members were elected at the September meeting.

Librarian *Orville D. Hoxie* then introduced the honored guest and main speaker for the evening, *Dr. Harold J. Wiesner*, of the Bendix Products Division, Bendix Aviation, who spoke on the topic, "Hard Anodizing of Aircraft Fuel Metering Components." This paper had been very well received at the National Convention in Cincinnati, and stimulated a lively discussion among members of the branch. The members expressed their interest and appreciation for Dr. Wiesner's talk by a hearty vote of applause.

Thomas C. Henner
Second Vice-President

Rochester Branch

The September meeting was held at the Rochester German Club, and was called to order by Pres. *Frank Beuckman*. Business matters discussed were: The election of delegates and alternates as follows:

Delegates — *Edwin Wallin, Frank Beuckman, Linwood Morrison.*

Alternates — *William Tucker, Roswell Minard, Joseph Hull.*

The Christmas party committee chosen for 1958 were Moffat, Cottrone and Wallin. A motion was made and seconded to have $200.00 from the treasury placed in a saving's account as a precaution against spending too much on regional meetings or branch parties without financial backing.

The speaker of the evening was introduced by Librarian *Ed Penczak*. *Kenneth Bellinger* of the Conversion Chemical Corp. gave a very interesting talk on conversion coating of zinc, cadmium, etc., covering the history of these coatings from beginning to end. Slides helped to make the presentation even more enjoyable. A question and answer period finished up the evening.

Linwood P. Morrison
Secretary-Treasurer

NATIONAL ASSN. OF METAL FINISHERS

Thirty metal finishing shop owners and operators were on hand, September 12, at the Buffalo Statler Hotel, to witness the charter presentation to the NAMF of Western New York by *George W. Taylor*, president of the national association. The charter was received by *Harold M. Karet*, president of Keystone Chromium Corp., Buffalo, the temporary president of the 13th affiliate of the NAMF.

National Charter presented to Harold M. Karet, center, temporary president of the NAMF of Western New York, by George W. Taylor, left, president of the National Association of Metal Finishers. Board member and Charter Night program chairman Edward N. Marlete, right, looks on approvingly.

Charter Night program chairman was *Edward N. Marlette*, president of Marlette Plating Co., Buffalo, a national director of the NAMF who also spearheaded the organization of the NAMF of Western N. Y. Special guests included members of the board of directors who held their quarterly meeting in Buffalo during the day.

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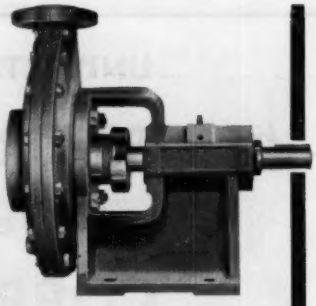

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P-45

NAMF Committees Appointed

Nearly 70 industry members were named to 14 committees by NAMF president *George W. Taylor*.

The appointments for 1958-59:

Standards Committee: Chairman, John T. Hyduke, Durable Plating Co., Cleveland; Philip J. Ritzenthaler, Plating Engineering Co., West Allis, Wis.; Charles Jensen, Jensen Plating Co., Chicago; Al Patterson, Patterson Plating Co., Toronto, Canada; Alfred T. Marinaro, Masters Electro-Plating Assn. of N. Y.; Webster B. Knight, Sr., Knight Plating Co., Detroit; J. F. Compton, Sr., Rawac Plating Co., Springfield, O.; and Lawrence A. Tosi, Cambridge Plating Co., Cambridge, Mass.

Educational Committee: Chairman, A. T. Leonard, Superior Plating, Inc., Minneapolis; Vice Chairman, Edward N. Marlette, Marlette Plating Co., Buffalo; William F. Acks, American Anodizing Co., Quincy, Mass.; Harry Brown, Philadelphia Electro Plating Co., Philadelphia; Glenn H. Friedt, Jr., United Platers, Inc., Deroit; Jack Wright, F. M. Callahan and Son, Malden, Mass.; Charles Snyder, Chas. D. Snyder & Son, Harrisburg, Pa.; and Mariano Ranno, Imperial Plating Co., Brooklyn.

Educational Subcommittees: Ethical Practices — Chairman, Harry Brown; Costs — Chairman, Edward N. Marlette.

Government Liaison: Chairman, David J. Griffin, Birmingham Plating Works, Birmingham, Ala.; Vice Chairman, Arthur G. Pierdon, Art Metal Plating Co., Washington, D. C.; Hermann Maack, Pottstown Plating Works, Pottstown, Pa.; Ernest D. Callahan, F. M. Callahan and Son, Malden, Mass.; Julian Nelkin, Henry Nelkin, Inc., New York; and William F. Walton, Walton & Lonsbury, Attleboro, Mass.

Industry Liaison Committee: Chairman, John Palik, Jr., National Plating Corp., Cleveland; Vice Chairman, Frank Kaiser, Long Island Mechanical Plating Co., Woodside, L. I., N. Y.; Charles N. Leva, Levco Metal Finishers, Inc., Long Island City, N. Y.; Alfred D'Agostino, Alberts Plating Works, Brooklyn; Robert Giesel, Adolph Plating, Inc., Chicago; Harold E. Coombes, Jr., Crown City Plating Co., El Monte, Calif.; Henry J. Siegel, Siegel-Roberts Plating Co., St. Louis; Joseph Eisenberg, Almag Chemical Corp., Baltimore; George Zurenda, Industrial Service Corp., Elmira, N. Y.; Bud Adelsperger, Auto City Plating Co., Detroit; Curtis M. Varland, Varland Metal Service, Inc., Cincinanti; Hirshel Stogner, Atlanta Plating Works, Atlanta; James E. Cogan, Jr., Globe Electroplating Co., Philadelphia; Robert Edwards, Edwards Plating Co., Toronto, Canada; James Campbell, Boston Nickel Plating Co., Boston; and Arthur W. Logozzo, Nutmeg Chrome Corp., West Hartford, Conn.

Membership-Public Relations Committee: Chairman, Harry M. Saltzberg, Modern Electroplating Co., Inc., Roxbury, Mass.; Vice Chairman, C. Edward Smith, B. Mercil & Sons Plating Co., Chicago; Harold F. Smith, The Smith Electrochemical Co., Cincinnati; Stephen P. Palisin, Empire Plating Co., Cleveland; Glenn H. Friedt, Jr.; A. G. Spindler, Evansville Plating Works, Evansville, Indiana; and Her-

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Strategic Materials Committee: Chairman, Mariano Ranno; Vice Chairman, Jules Horelick, Allied Metal Finishing Corp., Baltimore; and David J. Griffin.

Constitution and By Laws Revision Committee: Chairman, James E. Cogan, Jr.; Vice Chairman, Clyde Kelly, American Plating Co., Des Moines, Iowa; Harold W. Baker, Electro Galvanizing Co., Chicago; Bernie Stratton, Camtoid, Ltd., Ajax, Canada; Emil Olds, Olds Plating Corp., Detroit; and Joseph Berenato, Jr., J. Berenato, Philadelphia.

Awards Steering Committee: Chairman, Clyde Kelly; Robert Geuder, Allied Metal Finishing Corp., Baltimore; and Alfred T. Marinaro.

Detroit Convention Committee: Chairman, Glenn H. Friedt, Jr.; Co-Chairman, Webster B. Knight, Sr.; Edward N. Marlette; and Bud Adelsperger.

Los Angeles Convention Committee: Chairman, Harold E. Coombes, Sr., Crown City Plating Co., El Monte, Calif.; and Harold E. Coombes, Jr.

Parliamentarian: G. David Zeile, Plating Trades Assn. of Ohio.

News from California

By Fred A. Herr

Richard C. Barrett, president, Barrett Chemical Products Co., Shelton, Conn., was a visitor to California on a business and pleasure trip in September. Accompanied by Mrs. Barrett and their son Richard, Mr. Barrett motored from New England for a visit to his old home town, San Francisco, and stops in various cities on the outbound and homebound trip for business conferences. After a stop in San Francisco earlier in September to renew old acquaintanceships, Mr. Barrett addressed Los Angeles Branch, A.E.S. on September 10 on the sulfamate plating solutions which he pioneered. Other stops were made in Phoenix, Denver, St. Louis and Indianapolis.

Miss Shirlee Sulzinger, school teacher daughter of *Al Sulzinger*, plating and polishing division manager of the Hughes Aircraft Co., Culver City, Calif., returned on September 6 from a two months tour of Europe. She was a member of a 40-person guided tour which took in the world's fair in Brussels, and made visits to West Germany, Austria, Switzerland, Italy, Spain, Tangiers, France and England. The young lady got a particularly good look at England, Scotland and Ireland by renting an automobile and visiting the tourist spots, including the Shakespeare shrine at Strafford on Avon, at her leisure. Miss Sulzinger is a teacher in arts and languages at Baldwin Park High School, Baldwin Park, Calif.

A new $5,000,000 manufacturing plant for the western division of Standard Pressed Steel Co. has been completed at 2701 So. Harbor Blvd., San-

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ta Ana, Calif. The plant is equipped for production and finishing of nuts, fasteners and steel furniture in three separate production divisions.

Each of the three divisions has its own manufacturing bay. The pressed steel division, in which steel furniture of the firm's Columbia office and Hallowell industrial furniture lines are produced, is equipped with a 2100 foot powered, overhead conveyor system which automates final painting operations. The line cleans and precoats steel furniture sections and then paints them with an electrostatic spray process that permits rapid change between the 14 colors used.

The Cooper division of the new plant is equipped to produce a line of aircraft bolts made by a subsidiary formerly located in El Segundo, Calif., whose operations have been integrated into the Santa Ana plant.

Facilities in this division include two plating lines:

A completely new plating department is equipped with an automatic, conveyorized, horseshoe-shaped plating line for barrel plating small fasteners up to ½ inch O.D. Bolts exceeding ½ inch O.D., and those of greater length, are finished in a second cycle of 12 tanks which are serviced by plating trees holding 40 bolts each.

Consolidated Electrodynamics Corp., Pasadena, Calif., reports the promotion of *Francis T. Greenup* from chief products engineer to manager of engineering services and manager of the Alectra Department in its central engineering division. Greenup formerly served as a division engineer with Vitro Corp. of America in Washington, D. C.

The firm also announced appointment of *George M. Slocumb*, formerly a supervisory principal engineer, to assistant chief development engineer; and *E. James Penrose* as administrative manager.

The Ramo-Woolridge Corp., has announced plans for transferring its advanced electronic research and development operations to a proposed new center in the northwestern section of the San Fernando Valley area of Los Angeles.

Conditional to approval of a zone change by the Los Angeles City Planing Department, the firm proposes to purchase a 90-acre tract near Chatsworth Reservoir in San Fernando Valley as the site for a multi-million dollar missile research and development center. Occupancy of the first units is expected to take place early in 1960. The new facilities will house the company's general electronics groups engaged in developments in guided missiles, control and computing systems, advanced communications and weapons systems, research, data processing, and automation systems.

Dr. Ernest Scheller of Silberline Mfg. Co., Inc., Stamford, Conn., addressed the recent meeting of the Los Angeles Paint & Varnish Production Club at Michael's Restaurant, Los Angeles, in which he spoke on "Review and Developments in Aluminum Pigments."

The speaker gave a brief history of the use of aluminum in everyday life which, he said, had risen from 25 million pounds before World War II to 200 million pounds after the war. The

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Q A metal parts cleaning problems ?

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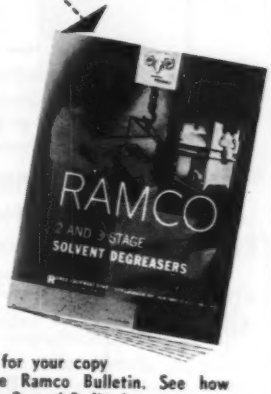

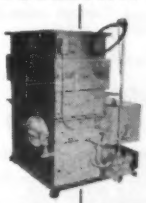

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DIV. OF RANDALL MFG. CO., INC.
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use of aluminum pigments, alone, according to the speaker, has doubled in the past 20 years. Aluminum pigments, the speaker pointed out, are primarily used for their resistance to the action of the gases found in the atmosphere, and for their reflectance, which is 90 to 95% of the heat and light which falls on a surface.

New officers elected at the club's September 10 meeting are: President, *Ted Beckert*, Sillers Paint & Varnish Co.; vice-president, *Harry Rindfleisch*, Trail Chemical Co.; treasurer, *Hubert B. Williams, Jr.*, Sherwin-Williams Co.; and secretary, *Leonard S. Feldman*, DeVoe & Reynolds Co., Inc.

Anadite, Inc., of South Gate, Calif., reports the appointment of *Felton H. Havins* as director of sales engineering for its affiliate company, Anadite, Inc., of Texas, with headquarters in Hurst, Tex., near Dallas. The firm is a major chemical milling and metal finishing concern which serves the missile, aircraft and electronics industries of the Southwestern United States.

Havins was formerly affiliated with North American Aviation, and most

Felton H. Havins

recently with Brunswick-Balke-Callender Co., as chief project engineer.

Business and civic leaders of Los Angeles and Vernon, Calif., joined representatives of the west coast's steel, metal working and metal processing industries in mid-summer to dedicate a new 90,000 square foot coil steel processing plant operated in Vernon, Calif., by American Can Co.

The new plant is equipped to process 15,000 and 16,000 pound coils of steel strip into standard can-making plate. The plant has an annual output of 90,000 tons of tin plate. The new coil operation is located adjacent to the company's existing can making plant at 4815 Santa Fe Ave., Vernon. The rated capacity of the expanded plant was announced as approximately two billion metal cans and paper containers annually.

Manufacturers' Literature

Hot Metallic Coating

Wright Metalcoaters, Inc., Dept. MF, 255 West St., So. Hackensack, N. J.

The above firm has issued a four page, illustrated brochure which gives a brief resume of its founder's research and developments in the field of hot metal coatings. Information is given on hot tinning, and the work done with pure tin, solder, the "Alu-Sol" process, electroplating, and electroless nickel.

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QUICKLY & EASILY REVISED
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STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF METAL FINISHING, published monthly at Westwood, New Jersey, for September 26, 1958.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Palmer H. Langdon, P. O. Box 272, Closter, N. J.; Editor, Nathaniel Hall, 40 E. 43rd St., Brooklyn 3, N. Y.; Managing editor, none; Business manager, John E. Trumbour, 57 Buena Vista Ave., Hawthorne, N. J.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address as well as that of each individual member, must be given.) Metals and Plastics Publications, Inc., 381 Broadway, Westwood, N. J.; Palmer H. Langdon, P. O. Box 272, Closter, N. J.; Anne M. Langdon, P. O. Box 272, Closter, N. J.; Louise L. Hasselback, 1627 16th Loop, Sandia Base, Albuquerque, N. M.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of the total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily., weekly, semiweekly, and triweekly newspapers only.)

PALMER H. LANGDON, Publisher.

Sworn to and subscribed before me this 29th day of September, 1958.

GARRETT KNYFD

(Seal) (My commission expires July 13, 1961)

Plating Barrel

Hardwood Line Mfg. Co., Dept. MF, 2022 N. California Ave., Chicago 47, Ill.

An illustrated bulletin is available on Lazo Model 2-SH heavy duty Lucite plating barrel. Nine exclusive features are listed, with the advantages thus gained, together with price and specifications. Some of the other models also manufactured by the firm are illustrated, giving the model number, dimensions and price.

Full Automatic Conversion Coating Machine

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

Convert-O-Matic, a full automatic straight line conversion coating machine, is described in a new, illustrated, four-page bulletin. Also described are features of a processing barrel with cover that opens and closes automatically to receive and discharge work load, a feature of some models.

A case history is included to show how one manufacturer integrated the machine into a highly automated line, using it for pre-cleaning and application of a black conversion coating. Photographs show end-on and side views, a typical control panel with variable timers, and an assortment of typical small parts to be treated by the machine.

Phosphating Compound

MacDermid Inc., Dept. MF, Waterbury, Conn.

Metex Durafos No. 6, a dry iron phosphating compound designed to clean and phosphate steel, aluminum, zinc and cadmium in one operation is fully described in Technical Data Sheet No. 11, a three-page usage and instruction sheet.

Cleaning Costs

Du Pont Electrochemicals Dept., Dept. MF, Wilmington, Del.

A new method for quickly analyzing and comparing metal cleaning costs is contained in a new booklet. By use of standard cost factors contained in the booklet, total hourly cleaning costs can be figured rapidly and with reasonable accuracy for inserting basic operating information into simple formulas.

Possible economies resulting from the so-called "High-Spot" cost analysis include savings in operating costs of existing cleaning systems as well as selection of the most economical system for new or expanded installations.

Plating Waste Treatment

Graver Water Conditioning Co., Dept. MF, 216 W. 14th St., New York 11, N. Y.

Technical Reprint T-163 discusses the various systems and methods, both batch and continuous, which may be used in the treatment of hexavalent chromium, cyanides, acids and alkalies.

Barrel Finishing Compounds

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

Compounds designed for deburring, burnishing, and descaling metals in barrel operations are the subject of an eight-page booklet recently published.

A thorough treatise on the nature and uses of barrel finishing, the booklet points up the necessity for the right combination of media, solution, speed, and loading. It tells how to preclean parts, how to select media for specific

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CLAIR SURFACE FINISHING MACHINES

Ten different basic CLAIR models to choose from.

Write for information on any surface finishing problem you may have.

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ELIMINATE COSTLY PLATING REJECTS

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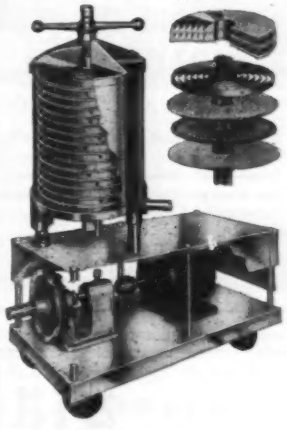

Sectional view of "Sealed-Disc" filter and pump unit. Portable or fixed installations are available in a wide range of capacities.

The Alsop Method of "SUB-MICRON" filtration assures you of totally clean plating solutions at all times with no interruption in your plating cycle! *All* impurities are automatically removed as fast as they are formed or introduced.

ALSOP

FREE! Your guide to better plating. "The Use of Filters in Electroplating" by J. B. Mohler

ENGINEERING CORPORATION
1311 Bright St., Milldale, Connecticut

metals, shapes and sizes of parts, operations to be performed, and finishes desired. Compounds discussed include alkaline and acidic, abrasive and non-abrasive, each designed for specific operations. Emphasis is placed on the need for proper barrel techniques.

Rectifiers

Syntron Co., Dept. MF, 732 Lexington Ave., Homer City, Pa.

A new 10-page catalog on selenium and silicon rectifier power units, amply illustrated, contains complete descriptions, data and specifications for standard three-phase units and special low voltage units, both with capacities ranging from ¾ to 500 kw, and for single-phase units with capacities from ¼ to 3 kw.

It also presents detailed information on special power units for underground operation and on selenium or silicon rectifier station-type battery chargers.

Ultrasonic Equipment

Narda Ultrasonics Corp., Dept. MF, 625 Main St., Westbury, N. Y.

A new short form, four-page catalog illustrates all of the equipment and provides technical information on sixty SonBlaster systems. Eight different generators and thirteen transducerized tanks are fully described. In addition, submersible transducers are shown, and a number of set-ups for employing submersibles in various power combinations are described.

Oxide and Tarnish Remover

MacDermid Inc., Dept. MF, Waterbury, Conn.

Metex L-5, an acid base liquid used to remove oxide and tarnish from copper, copper alloys and silver is fully described in Technical Data Sheet No. 77, a four-page usage and instruction sheet.

Immersion Electric Heaters

General Electric Co., Dept. MF, Schenectady 5, N. Y.

Bulletin GER-1333 discusses advantages of electric heat for plating baths; and gives tips on proper heater selection, installation, power and maintenance.

A table guide to proper heater wattage, selection guide to determine right heater sheath, diagrams showing proper installation of immersion heaters and seven rules for better heater maintenance are included in the article.

Bulletin GER-1161 is a four-page article which shows how to get the most service with least maintenance from industrial immersion heaters. It discusses operation and maintenance problems involved with both free-flowing and forced circulations and tells how heaters should be installed for various applications. It also gives rules for keeping heaters healthy.

Barrel Finishing Media

The Carborundum Co., Electro Minerals Div., Dept. MF, Niagara Falls, N. Y.

"Tumbling Media for Barrel Finishing," a new informative 20-page, four-color booklet is based on the very latest laboratory and factory case studies, and is designed as a practical handbook for supervisors and operators. It treats kinds of tumbling media; types of applications; types and functions of tumbling barrels; fixturing and linings for tumbling barrels; compounds and cleaners; do's and don'ts on the use of water; analyses of typical tumbling jobs.

The tumbling booklet gives factual current case histories on removing paint and breaking corners; removing rust; improving finish; rounding corners; removing burrs; and removing

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381 Broadway Westwood, N. J.

heat treat scale. Handy "Do's and Don'ts" on tumbling media are stated concisely.

Barrel Finishing Machine

Metal Finish, Inc., Dept. MF, Frelinghuysen Ave., Newark, N. J.

Bulletin 255 describes the recently announced Vibraslide barrel finishing machine in which a vibrational force is incorporated into the barrel itself which allows the finishing work to be done in a fraction of the time previously necessary, with no damage to the parts being finished.

Vacuum Metalizing Coils

Sylvania Electric Prod. Inc., Chemical and Metallurgical Div., Dept. MF, Towanda, Pa.

A new specifications booklet, "Tungsten Coils for Vacuum Metalizing," lists each coil according to dimensions and type of material rather than by arbitrary code number.

Total filament length (T.F.L.) measurements have been converted from millimeters to inches. Nomographs also show the various strands in ohms per inch as well as in ohms per millimeter. Temperature is shown in Centigrade rather than Kelvin to facilitate measurements and compilation.

Barrel Finishing Machines

Techline Div., Wheelabrator Corp., Dept. MF, 1179 Avenue V, Vicksburg, Mich.

Multiple-compartment barrel finishing machines are illustrated and described in a new Bulletin No. 201.

Water Conditioning

Cochrane Corp., Dept. MF, Philadelphia, Pa.

A new, comprehensive forty-page book titled "Handbook on Demineralizing" compares various methods of water treatment. It goes into the characteristics of the various types of available cation and anion exchange materials and offers data on operating costs of demineralizing.

It tells when to use two-bed, three-bed, four-bed, mixed or mono-bed demineralizers. It also indicates when decarbonators or vacuum deaerators are required. The bulletin is replete with typical flow diagrams, photos of installations and the chemical results obtained with demineralization. Ask for Publication 5800.

Metal Spraying

Metallizing Engineering Co., Inc., Dept. MF, 1101 Prospect Ave., Westbury, N. Y.

A new basic engineering data bulletin, 136A, on wire and powder sprayed coatings of metals and ceramics covers their basic characteristics, including hardness, tensile and bond strength of various coatings, plus a wide range of mechanical and electrical-electronic applications which are both illustrated and described. The bulletin also covers various types of spraying equipment including automatic controls used for production line applications of such coatings. A number of tabular data are included, such as spraying speeds, material and gas consumption and square feet covered per hour with various types of metals and ceramics. New materials such as the recently developed tungsten carbide powders for hard-facing applications are also covered.

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Users are enthusiastic about STRIPODE. Here's what they say, "Speeds up removal of nickel plate"; "Protects the metal from pitting and roughening"; "Uses less acid"; "Gives marked savings by eliminating sand blasting and severe buffing operations". Try it in your plant.

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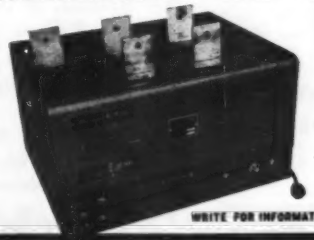

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NEW BOOKS

Directory of New England Manufacturers

Published by George D. Hall Co., 20 Kilby St., Boston 9, Mass. 788 pages. Price: $45.

The 1959 edition of this directory is the 23rd annual revised and corrected register of 25,000 executives of 13,000 manufacturers in Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut. Manufacturers of all sizes throughout these six New England states are listed alphabetically (including company name and address, executive personnel, products manufactured, number of employees and capital rating), geographically, by product and by brand name.

A.S.T.M. Standards on Paint, Varnish, Lacquer and Related Products

Published by A.S.T.M., 1916 Race St., Phila. 3, Pa. 1958. Price: $8.25. 1000 pages, paper cover.

This publication prepared by Committee D-1 supercedes the January 1955 edition and contains some 200 standards of which 27 are new, revised, or have had their statuses recently changed. It has been compiled to collect all of the A.S.T.M. specifications, methods of test, and definitions pertaining to paint, varnish, lacquer, and related products, in order to assemble them together in convenient form for use by the industry. A section on standard specifications for A.S.T.M. thermometers is also included.

Standards covered by this publication are for pigments, drying oils, paint driers, thinners, shellac, varnish, lacquer, traffic paint, bituminus emulsions, printing inks, putty, glazing and caulking compounds, weathering tests, naval stores, cellulose derivatives, and miscellaneous specifications.

OBITUARIES

CHARLES HOLLAND

Charles Holland, president of *J. Holland & Sons, Inc.*, died September 16th at his home, 222 W. Olive St., Long Beach, N. Y.

Charles joined his father, *Joseph Holland*, in 1916 and, with his brothers, *William* and *Louis*, founded the company. He was active for 40 years in the electroplating and affiliated industries.

Surviving are his widow *Henrietta*, two sons, two daughters, two brothers and four sisters.

O. S. McGUFFEY

O. S. McGuffey, former chief engineer at *Tranter Mfg., Inc.*, Lansing, Mich., died Sept. 11 at his home in Lansing. He was 62 years old and had retired Dec. 31, 1957.

A native of McGuffey, Ohio, he had been a Lansing resident 26 years. During that time he was associated as chief engineer with the firm, joining it when it was known as Kold-Hold Mfg. Co. His son, *James W. McGuffey* now is refrigeration engineer for the Kold-Hold Division of Tranter.

Besides his son, he is survived by his wife, *Hazel W.*, a daughter, *Mrs. Carlyle Perry* of Elizabeth, N. J., two sisters, a brother and three grandchildren.

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SINGLE ADDITION BRIGHTENER
THE MOST TALKED ABOUT PROCESS IN THE MIDWEST
It produces deposits which are bright from deep recesses to very high densities.

When used under recommended conditions with Electrosolv, (Electrosolv is a superior addition agent for the improvement of anode corrosion) it is capable of depositing copper at the rate of a mil. in 10 minutes.

Operating range is wide:
Temperatures from 140-180°F.
Wide range of solution composition.

Air Agitation with 300-W.
Non-foaming wetting agent.
No electrocleaning required for direct plating with nickel.

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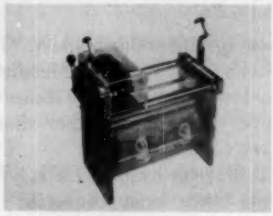
LAZO — The Pioneer in Lucite Barrel Platers for Better Metal Finishing



LAZO Model 2-BP-6 . . .
Single Barrel . . . Motorized . . . Portable

Size: 6"x12" inside cylinder dimen.
Size: Overall: 9"x16"x16" high
3/32" Standard Perforations
Any Type Parts up to 3" dia.
All Plating Solutions
Holds up to 15 lbs.

Designed for easy handling. Light in weight. One idler gear for greater efficiency, with fewer moving parts. Acid and alkali resistant driving gears for plus assurance against breakdown. Rubber-covered, corrosion-free truss rods. No special attachments required to adapt these units to present tanks.

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1—6000/3000 AMPERE, 6/12 VOLT. **ELECTRIC PRODUCTS,** Synch.
1—5000/2500 AMP., 9/18 V., 25°C., **CHANDEYSSON,** Synch. Exciter-in head.
1—5000/2500 AMPERE, 6/12 VOLT, 25°C. **CHANDEYSSON,** Synch.
1—4000/2000 AMPERE, 6/12 VOLT. **H-VM-M,** Synch., Exc.-in-head.
3—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—2000/1000 AMPERE, 6/12 VOLT. **HANSON - VAN WINKLE - MUNNING.**
1—1500/750 AMPERE, 12/24 VOLT. **CHANDEYSSON,** Synchronous.

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1—1000 AMPERE, 30 VOLT. **IDEAL,** Exciter-in-head.
1—750 AMPERE, 60 VOLT. **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT. **CHANDEYSSON,** Synchronous, Exciter-in-head.
4—400 AMPERE, 40 VOLT. **M.G.C.,** Separately Excited.

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1—**G. E.** 2000/1000 AMP., 6/12 V.
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1—1500/750 AMPERE 6/12 VOLT, **UDYLITE-MALLORY.**
4—1440/720 AMPERE, 6/12 VOLT, **UDYLITE-MALLORY.**
1—**RAPID** 1500 AMP., 9 V. Germanium Remote AVS 220/440/3/60.
1—**RAPID** 1000 AMPERE, 12 VOLTS Germanium, 440/3/60.
1—**RAPID** 750 AMP, 6 VOLT SELENIUM REMOTE CONTROL, 440/3/60 AC.
1—**RAPID** 750 AMP., 12 VOLT, Selenium, Self-Contained 440/3/60 AC.

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2—**CROWN & H-VW-M** Centrifugal Driers No. 1 and No. 2 with Heat.
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1—No. 101 Production Pipe Polishers.
3—**L'HOMMEDIEU** 5 HP Variable Speed Buffing Lathes.
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1—American Giant 750 amps. 6 volts
3—Udylite rectifiers 1500/750 amp. 6/12 V.
R-A 500 amp., 6 V. with control.
G. E. 500 amps. 6 volts with control.
Rapid 300 amps. 6 volts with control.
Udylite 500 amps. 6 volts with control.

SEMI-AUTOMATIC PLATING MACHINES

5—From 12' to 32' long for nickel and cyanide.

PLATING BARRELS

Daniels #3.
3—Lasalco steel 36 x 18 Lucite cylinder.
1—Lasalco rubber lined 30 x 15.
1—H-VW-M steel 36 x 18.
1—Udylite steel—42 x 15.
2—Udylite multi-purpose barrel — hard rubber cylinder.
1—Belke oblique plater.

FILTERS

Industrial, Alsop, Sethco — all sizes — nickel and cyanide solutions.

TUMBLING BARRELS

5—Abbott barrels.
#2H Baird poliaction Tumbler.
10—Baird barrels 2C tilting type.
8—Henderson barrels 5A tilting type.
4—Globe barrels.

POLISHING MACHINES

1—Production Machine #101 — 7½ H.P.
4—#101 Tandum 15 H.P.
2—Production Machine #484-2.
2—Divine Model VM-10 — 10 H.P.
2—L'Hommedieu 5 H.P. variable speed.
15—Holland 5 H.P. — 7½ H.P. — 10 H.P.
1—Acme L-82 — 7½ H.P.
Gardener 5 H.P. — 7½ H.P.
6—Divine Idlers.

DRYERS

Ronci R100.
2—Barrett centrifugal dryers.
1—H-VW-M centrifugal dryer.
2—Kreider #12 steam explosionproof mtrs.

BOILERS

Kane gas fired 20 H.P., 7½ H.P.

RHEOSTATS — all sizes

MISCELLANEOUS

1—Detrex alkaline belt washer.
1—Philips electric degreaser.
1—Blakeslee pump type washer.
Blowers and motors—multivain (fume) peddle wheel (dust).
1—Blakslee washer.

TANKS

300—All sizes — all linings.

COMPLETE PLANTS PURCHASED — SURPLUS EQUIPMENT WANTED.

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EQUIPMENT AND SUPPLY CORP.
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Money Saving Prices
Immediate Delivery

30—Semi-Automatic — single to eight spindle machines, Hammond, Acme, Divine, Automatic, etc.

50—Various Sizes Heat Exchangers, Stainless, Lead, Carbate, Steel. All sizes, with pump units.
100—Sturgis, Roto Finish, Baird, Crown, Belke, Abbott, Henderson and other makes of tumbling, cleaning and burnishing barrels.

300—Assorted size wood, steel, rubber, plastic, lead lined and stainless tanks up to 30 ft. long.

400—Assorted plating rheostats, double pole reversing switches, from 10 amp. up to 5000 amps.
300—Assorted buffing and polishing machines from 1 HP to 50 HP single and double end spindles, including some variable speed types.
50—Assorted Plating Barrel Units, Standard Makes for all solutions.

BUY OF THE MONTH

25—Assorted full automatic rotary Buffing, Polishing, & Deburring Machines, Divine, Hammond, Packer, Acme, etc. tables from 20" to 72" diameter, with 3, 4, 5 and 6 heads.

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10—Semi automatic plating machines, 10 ft. to 35 ft. long for nickel, copper and chrome.
5—Industrial Filters, RDR-2, 36 x 3630, for nickel, complete.
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90—Various size Generator sets from 50 to 10,000 amps, Chandeysson, Hanson Van Winkle Munning, Bogue and other standard makes, all complete with panel boards, starters, etc. voltage range 2 volts up to 100 volts, for all purposes.

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PARTIAL LIST OF REBUILT EQUIPMENT WITH A NEW GUARANTEE

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1—Rapid 750 amperes @ 12 d.c. volts.
1—Rapid 100 amperes @ 12 volts.
6—Selenium 125 amperes @ 12 d.c. volts.
1—Selenium 150 amperes @ 12 d.c. volts.
1—Rapid 200 amperes @ 6 d.c. volts.
1—Hobart 200 amperes @ 12 d.c. volts.
1—G.E. 300 amperes @ 6 d.c. volts.
5—Selenium 500 amperes @ 6 d.c. volts.
10—Udylite 750 amperes @ 12 d.c. volts.
1—Richardson Allen 1000 amps. @ 6 d.c. v.
1—H.V.W.M. 1250 amperes at 12 d.c. volts.
10—Udylite 1500 amperes @ 6 d.c. volts.
2—Rapid 2000 amperes at 6 d.c. volts.
1—H.V.W.M. 2500 amperes @ 6 d.c. volts.
5—Udylite 3000 amperes @ 6 d.c. volts.
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Amp.	Volt	Make
100	80/90	Reliance
125	40	Star
175	14	Delco
200	7½	Chandeysson
200	65	G. E.
200	7½	Hobart
300	7½	Hobart
400	60/60	G. E.
400	8	H-V-W
750 (Twin)	6	H-V-W
940	32	Elec. Prod.
1000/500	6/12	Chandeysson
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
1500	70	Century
2500/1250	6/12	Elec. Prod.
5000/2500	6/12	Columbia
5000/2500	9/18	Chandeysson
7500	9	Elec. Prod.

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5,000 Amp., 50 mv.
6,000 Amp., 50 mv.
10,000 Amp., 50 mv.
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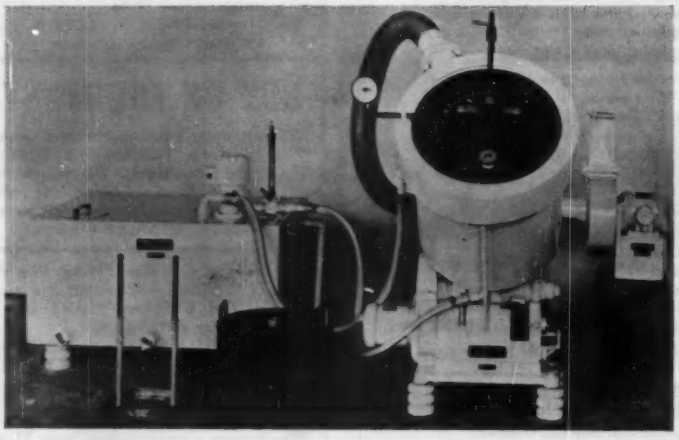

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6/12 Volts 5000/2500 Amperes H.V.W. Synchronous, w/control.
6/12/24 Volts 6000/3000/1500 Amperes H.V.W. w/control, Bargain.
6/12 Volts 5000/2500 Amperes w/control.
6/12 Volts 3500-1725 Amperes Bogue, w/control.
12/24 Volts 1660/830 Amperes Jantz-Lietz, w/control.
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7½/15 Volts 1000/500 Amperes w/control Herbart or M.G. Corp. (3 units).
6/12 Vogue 1000/500 Amperes Bogue.
60 Volts 750 Amperes Star Kimball.
30 Volts 400 Amperes Electric Products.
6/12 Volts 750/375 Amperes H.V.W. w/control (2 units)
6/12 Volts 500/250 Amperes Chandeysson & Hobart w/control (3 units)
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6—7½ Volts 200 Amperes Hobart, Roth (2 units).
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All Replacement Parts for all Above Machines in stock.
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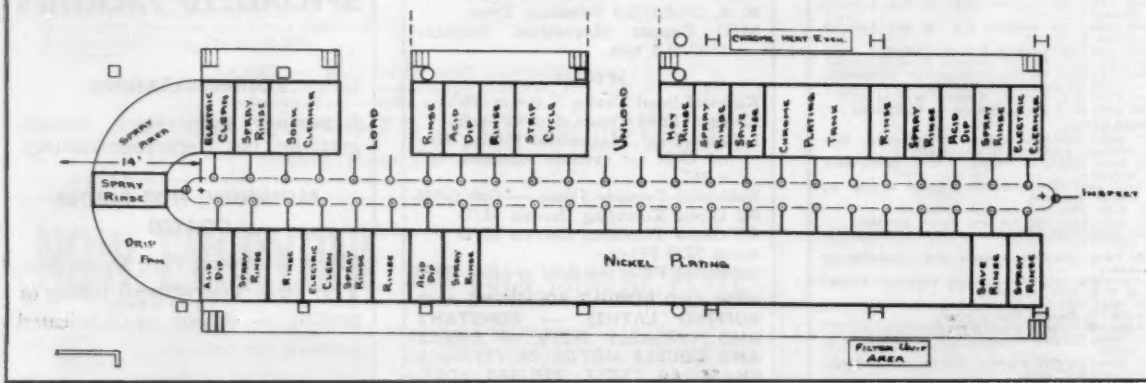

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Carrier Centers	42″	Chrome Generator	9 Volt 7,500 Amp.
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21′-8″ wide x 103′-0″ long		Cleaning Gen.	7-14 Volt 2,500-125

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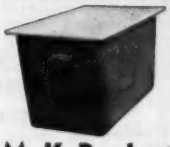

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SITUATION WANTED—Graduate chemist, age 44; 22 years diversified industrial experience. Extensive background in all phases of metal finishing, surface treatments and corrosion problems. Equipment design; process control, research and development. Seek responsible position in Metropolitan New York City area. Address: October 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

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June 15-19, 1959

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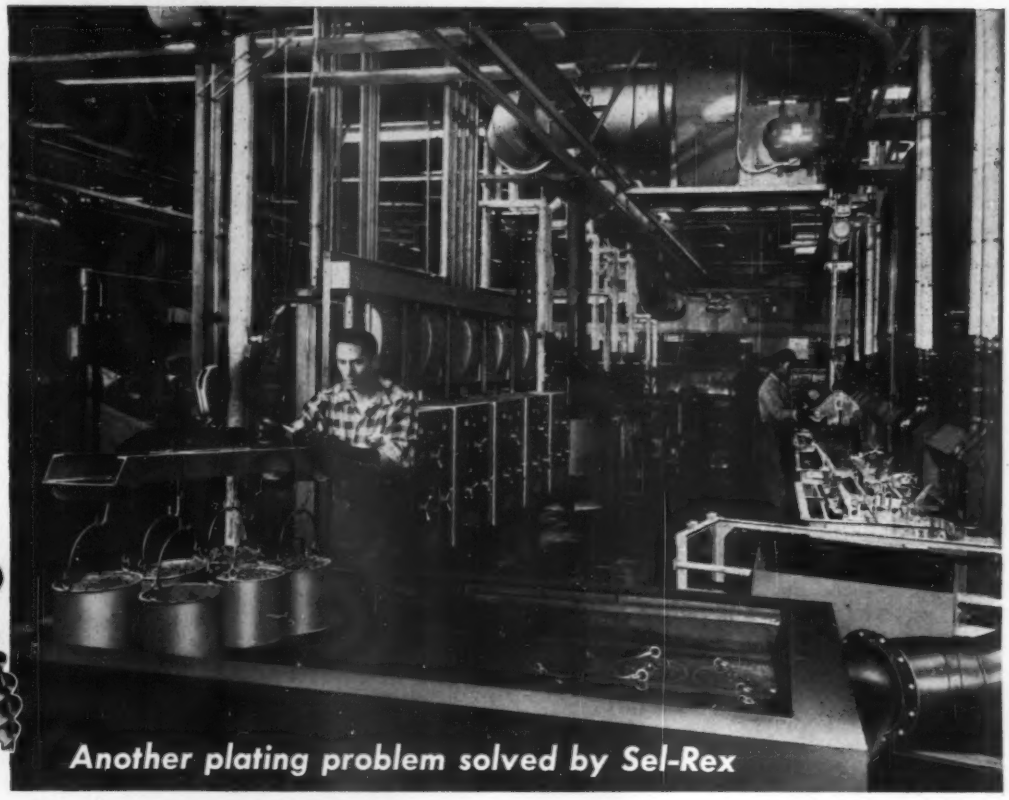

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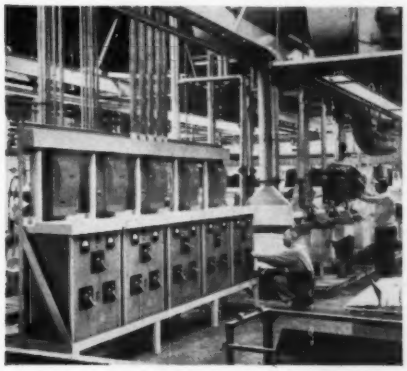

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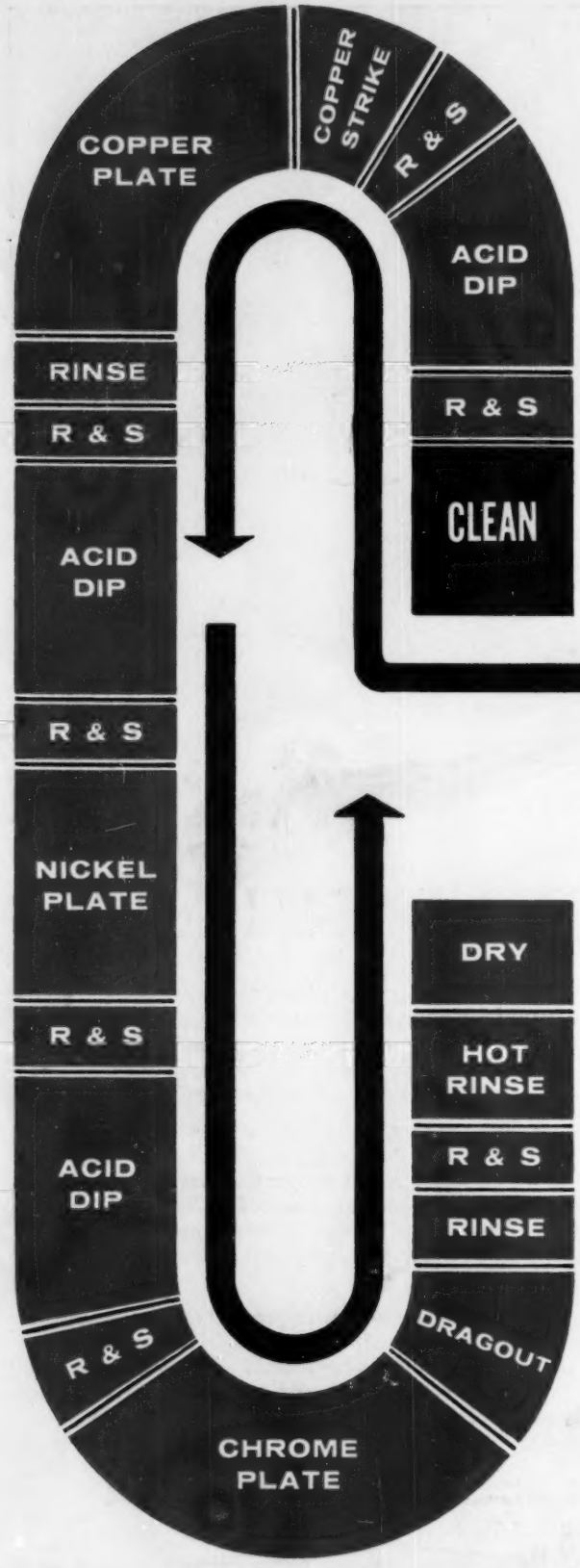

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